BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 23. Lancaster, Pa., October 25, 1896. No. 10.

The Genus Cephalozia in North America.

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The Trigonantheae as outlined by Richard Spruce form a somewhat natural group of the Jungermaniaceae. With us the species are all foliose, but in certain neo-tropical genera the gametophyte is reduced almost to the condition of protonema, producing leaves only on the branches bearing the sex apparatus. In the Australasian genus *Zoopsis*, the simple thalloid shoot in some species is provided with rudimentary leaves only, formed of one or two cells. The tribe, therefore, contains within itself, some of the connecting links which ally the more usual forms to the simple primitive hepatics.

The tribe is characterized by the archegonia being borne on a usually short ventral branch,* with a normally triangular perianth, so placed that the third or odd angle is ventral, the remaining two being lateral. The underleaves are usually wanting or small, only attaining the dignity of a third series of leaves in some of the species of *Lepidozia*, though in *Bazzania* and *Kantia* they are well marked structures. The tribe contains some species that form conspicuous mats like *Bazzania*, but others are small, minute or even microscopic in size. They inhabit old logs, or grow on the ground in swamps, on clay banks or occasionally even in sand and on the faces of moss-covered rocks, but with us are rarely, if ever, found on erect trees, where the species of *Frullania*, *Lejeunea*, *Radula*

* Exceptions to this occur in some rare species of *Cephalozia* where they are terminal.

and *Porella* are most abundant. One species is semi-aquatic in bogs.

Schiffner* recognizes twenty-six genera. Strongly in contrast with this arrangement is that of Spruce,† in which ten of the genera recognized by Schiffner appear as sub-genera of *Cephalozia*. Probably a more rational arrangement would be reached in a mean between these two somewhat extreme views.

The genera represented in temperate and boreal North America may be separated by the following artificial synopsis based on forms lacking the sporophyte or perianth as species are often met with in this condition:‡

Leaves succubous or rarely transverse; plants small or minute (except in some species of *Odontoschisma*).

eaves deeply bidentate or bifid.

Underleaves rarely present except on perianth-bearing branches. CEPHALOZIA.

Underleaves well developed.

Without root hairs; underleaves like those of the stem. HYGROBIELLA.

With root-hairs; underleaves undivided. PLEUROCLADA.

Leaves rounded, entire or nearly so. ODONTOSCHISMA.

Leaves incubous; plants larger, often conspicuous (except in *Lepidozia*).

Leaves rounded, entire or minutely two-toothed; perianth wanting, the sporophyte rising from a buried pouch. KANTIA.

Leaves narrowed toward the end, usually 3-toothed. BAZZANIA.

Leaves palmately 3-4-cleft or divided. LEPIDOZIA.

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* Hepaticae, in Engler-Prantl: Die natürl. Pflanzenfam. 13: 94–103. 1893.

† On Cephalozia. 1882.

‡ The question so frequently asked by those who collect mosses is again answered here: "Why is it that we find hepatics so rarely in fruit?" In the first place the "fruit" (*sporophyte*) of the hepatic is less conspicuous than that of the true mosses and the seta is often short. The first answer then is: "Because you overlook it." In the second place there is a fundamental difference between the sporophyte of the hepatic and that of mosses. In the mosses the capsule develops after the seta; the seta is, therefore, a somewhat permanent structure and the moss remains "in fruit" for a considerable length of time. In the hepatic the capsule develops within the calyptra (which in turn is surrounded by the perianth) until fully mature when the seta develops, pushing through the calyptra; the seta is, therefore, a temporary and usually ephemeral structure, often withering away soon after the spores are scattered. The perianth is a more permanent structure, and specific and even generic characters are founded on it. Some stage of its development can usually be found in most hepatics. Except in a few cases the characters of the sporophyte are unimportant from a taxonomic standpoint when generic and specific limits are considered, a condition of things widely different from that which obtains among the mosses.

Of the above genera, *Hygrobiella* is represented by three north European species one of which *H. laxifolia* (Hook.) Spruce has recently been sent in from Idaho collected by Sandberg; it is also found in Greenland; *Pleuroclada*, a monotypic genus of boreal regions, has been found by Macoun in the Rocky Mts. of British America; *Odontoschisma* has three American species as known at present; *Kantia* is represented by four American species, one of them, *K. arguta* (N. & M.) Lindb., introduced in greenhouses;* *Bazannia*, so abundantly represented in tropical and south Temperate regions, has with us the two northern species that are likewise common in Europe; and *Lepidozia*, likewise a large genus of universal distribution, has with us only three species.†

The remaining genus, *Cephalozia*, is the largest and the most widely distributed genus of the tribe on our continent. The European species were somewhat increased in number by the researches of Lindberg in Scandanavia, and the greater part of the tangled synonomy, to which Lindberg also contributed, was worked out by Spruce in 1882, athough he added to the tangle by knowingly giving to one species the same name that Lindberg had already given (unwittingly) to another species! The latest curiosity in the nomenclature of the genus is that expressed by Schiffner,‡ who, after establishing all of Spruce's subgenera as genera, rejected the old generic name, *Cephalozia*, which has been in use for over a half century, and adopted the subgeneric name *Eucephalozia*, first used by Spruce in 1882 to designate the typical members of the genus, as a generic name!

Cephalozia was proposed as a section of *Jungermania* by Dumortier in 1831 and was erected into a distinct genus by the same

**Kantia aquatica* Underw. in Hep. Amer. (exsic.) no. 107, is a curious sub, merged form of *Lejeunea* (probably *L. serpyllifolia*) which has lost its basal lobes, apparently a case of reversion resulting from its abnormal habitat. Herr Stephani discovered rudiments of a perianth in one specimen which led to the determination of the true relations of this curious form.

†*L. chaetophylla tenuis* Pears. cited by Evans (Bull. Torr. Bot. Club, **20**: 308 1893), is a true *Blepharostoma* and must be known as *B. nematodes* (Aust.). It is *Cephalozia nematodes* Aust. Bull. Torr. Bot. Club, **6**: 302. 1879. *L. Californica* Aust. Bull Torr. Bot. Club, **6**: 19, 1875, is of course *Ptilidium Californicum*.

‡*Loc. cit.* 97. A few such anarchistic movements in nomenclature, exceeding anything produced in this country with all its objectionable "*Freiheit*," and entirely without reason or warrant, mar this otherwise excellent work.

author in 1835 with *Jungermania byssacea* Roth. as a type species. It was not accepted by the authors of the Synopsis Hepaticarum 1844–7, but the same is true of many other early genera not proposed by Nees, one of the authors of the work. It was afterwards accepted by Gottsche, and later hepaticologists have accepted it without question, Schiffner alone excepted, as above stated. Of its sub-genera, as noted below, *Nowellia* differs most widely in its general facies from the rest of the genus, but none of the groups seem sufficiently separate for generic distinction. The genus as here recognized can be characterized as follows:

Cephalozia Dumort.

Gametophyte mostly small or minute, usually close-creeping; stems branching ventrally or rarely laterally, often flagelliferous; leaves obliquely placed, succubous, bifid from one-third to over one-half their length; leaf cells usually large, transparent, mostly hexagonal; under-leaves usually wanting on the stems, often present on perianth-bearing branches. Perianth long, triangular, with a narrowed, toothed or ciliate mouth.

Sporophyte an oval or oblong-cylindric capsule on an ephemeral seta, varying in different species from 2 mm. to 2 cm. long.

The genus includes some sixty species well distributed, but best known from the North Temperate zone. Fourteen species are found in America north of Mexico. These can be distinguished by the following table, which has been constructed with special reference to material in which the perianth characters can not be seen:

Leaves deeply concave or somewhat saccate with two long, curved, slender divisions; perianth on a short ventral branch. § Nowellia.
  Leaf cells 20–25 μ, isodiametric 1. *C. curvifolia.*
Leaves not deeply concave nor saccate.
  Branching ventral; leaves bifid, but the leaf margins otherwise entire.
    Leaves wider than the stem; involucral leaves not united. § Eucephalozia.
      Leaves small, 0.35 mm. or less long.
        Leaves wide (0.35–0.4 mm.) decurrent at base; leaf-cells 35–40 μ; dioicous; perianth fleshy (3 cells thick at base.) 2. *C. media.*
        Leaves narrow (0.2–0.25 mm.) not decurrent at base; leaf-cells 20–30 μ; perianth thin.
          Leaves strongly narrowed above the base; perianth obovate-oblong. 3. *C. Sullivantiae.*

Leaves not specially narrowed above the base.
Perianth linear-fusiform, widest below the middle; dioicous. 4. *C. catenulata.*
Perianth linear-clavate, widest above the middle; dioicous or autoicous. 5. *C. Virginiana.*
Leaves medium size, 0.5–0.65 mm. long; leaf-cells 40–50 μ.
Leaves longer than broad, cleft half way to the base or more; perianth thin.
Smaller; leaves 0.5 mm. or less long; usually monoicous. 6. *C. bicuspidata.*
Larger; leaves 0.65 long with apiculate divisions; dioicous. 7. *C. extensa.*
Leaves as broad or broader than long; monoicous; perianth fleshy, usually narrowed at base. 8. *C. pleniceps.*
Leaves larger, 1–1.35 mm. long, usually narrowed at base; plant semi-aquatic. 9. *C. fluitans.*
Leaves only about the width of the stem or even narrower; innermost involucral leaves united into a cup. § CEPHALOZIELLA.
Plants small; stems 2–4 mm. long.
Perianth linear or narrowly fusiform, the mouth denticulate or nearly entire. 10. *C. divaricata.*
Perianth ovate-fusiform, the mouth ciliate. 11. *C. Macounii.*
Plants minute; stems less than 2 mm. long.
Underleaves lanceolate, entire, often present only near the end of the stem. 12. *C. Sullivantii.*
Underleaves everywhere present, the upper ones bifid. 13. *C. minima.*
Branching lateral; leaves bifid with dentate margins; perianth terminal; underleaves usually present. § PRIONOLOBUS.
Leaves complicate-bifid, equitant. 14. *C. Turneri.*

1. CEPHALOZIA CURVIFOLIA (Dicks.) Dumort. Recueil d' Obs. sur les Jung. 18. 1835.

Jungermannia curvifolia Dicks. Pl. Crypt. Brit. 2: 15. *pl. 5, f. 7.* 1790.

Nowellia curvifolia Mitt. in Godman, Nat. His. Açores, 321. 1870.

Gametophyte a green or reddish slender creeping leafy axis, sparingly branching; leaves somewhat orbicular, deeply concave, with two slender incurved teeth widely separated at base and soon becoming one cell wide; underleaves wanting; leaf cells isodiametric, 20–25 μ in diameter: monoicous or dioicous; perianth on a short branch, triangular-prismatic, about 1.3 mm. long, plicate, with the mouth constricted and short ciliate; involucral leaves in two or three rows, deeply bifid with broad serrulate divisions.

Sporophyte a dark brown oval capsule 0.7–0.8 mm. long, on a short seta 0.5–2 cm. high; spores 6–8 μ in diameter, nearly spherical, dark brown; elaters 250 long, wider than the spores, bispiral.

A very common species on rotten wood distributed from the mountain region of Georgia to Wisconsin and northeastward; also European.

It has been distributed by Sullivant: Musc. Alleg. 242 (as *Jungermannia curvifolia*); Austin: Hep. Bor.–Am. 60; and in Hep. Amer. 17. Several figures exist; of these, Hooker, Brit. Jung. *pl. 15*, and Suppl. *pl. 1*, and Ekart, Syn. Hep. Germ. *pl. 8. f. 59*, are among the best; that in Smith, Eng. Bot. *pl. 1304* poorly represents the plant.

2. CEPHALOZIA MEDIA Lindb. Medd. Soc. Faun. et Fl. Fenn. 6: 242. 1881.

Cephalozia multiflora Spruce, On Cephalozia, 37. 1882 (not of Lindb.).

Gametophyte a slender creeping, usually pale green leafy stem; leaves often wider than long, decurrent, slightly imbricate, bifid one third their length with an obtuse or rarely lunate sinus and acute connivent segments; leaf-cells mostly uniform, 36–40 μ in diameter: dioicous; perianth on a very short branch, linear-fusiform, fleshy, formed of three layers of cells at base and two above; antheridia usually near the apex of a branch. Sporophyte a short-stalked, oblong-cylindric capsule enclosed at first in a fleshy calyptra formed of three layers of cells; spores cinnamon-colored.

One of our most common species growing in large patches on decaying logs and rarely on the ground from Florida to Virginia, California and generally distributed over the northern portion of America; also European. The species was long confused with *C. connivens* (Dicks.) both in this country and in Europe. During this period it was distributed under the original name of *Jungermannia connivens* by Sullivant, Musc. Alleg. 246, and as *Cephalozia connivens* by Austin, Hep. Bor.–Am. 57. Lindberg, thinking that this species was the true *C. connivens*, gave to that species the name of *C. multiflora*. Later, Spruce, identifying the true *C. connivens*, unfortunately gave the same name (*C. multiflora*) to the present species. Under this name the species was distributed by

us in Hep. Amer. 38 and by Macoun, Can. Hep. 19* Fortunately Lindberg, a year earlier than Spruce, had given the species a name that will effectually blot out the confusion arising from the use of the homonym, *C. multiflora*.

3. CEPHALOZIA SULLIVANTIAE (Aust.)

Jungermannia Sullivantiae Aust. Bull. Torr. Bot. Club, 3: 12. 1872. (Not *J. Sullivantii* Aust. Proc. Acad. Phila. for 1869: 221. 1869.)

Gametophyte a short, close-creeping, sparingly branched stem; leaves whitish, usually spaced, about 0.3–0.35 mm. long, two-thirds as wide, strongly narrowed just above the base, somewhat ovate, erect, spreading or nearly horizontal, bifid to one-half or two-thirds their length, with obtuse sinus and acute usually divaricate divisions; leaf cells 25–30 μ in diameter; dioicous; perianth at the end of a very short branch, obovate-oblong, 1.2–1.5 mm. long, the mouth deeply 10-cleft; involucral leaves mostly bifid with a large tooth on the outer margin near the middle or towards the base. Sporophyte a short-stalked mostly short oval capsule; mature spores not seen.

Apparently an uncommon species, seen only as yet from Ohio, whence it was distributed by Sullivant: Musc. Alleg. 241 (as *Jungermannia bicuspidata*, var. 2); Austin also reported it from Illinois, but I have seen no specimens. The name is unfortunately too near *C. Sullivantii* and may need change to prevent confusion.

4. CEPHALOZIA CATENULATA (Hüben.) Spruce, On Cephalozia, 33. 1882.

Jungermannia catenulata Hüben. Hepaticol. Germ. 169. 1834.

Jungermannia reclusa Tayl. Lond. Jour. Bot. 5: 278. 1846.

Cephalozia serriflora Lindb. Medd. Soc. Faun. et. Fl. Fenn. 1878.

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* In my set of Macoun's Canadian Hepaticae this species occurs under the following numbers:

No. 39 as *Cephalozia Lammersiana.*

No. 18 as *Cephalozia catenulata.*

No. 20 (mostly) as *Cephalozia pleniceps.*

The species thus appears in one set of exsiccatae under four distinct names! The smaller species of Hepaticae, like *Cephalozia* and *Marsupella*, are likely to grow intermixed, so that the greatest care is necessary in selecting them for issues of exsiccatae wh ch are to be used as works of reference. Spruce has called attention to the similar errors in European exsiccatae, particularly Gottsche and Rabenhorst's Hepaticae Europeae.

Gametophyte a slender creeping stem with pale leaves which are incurved in drying so as to cause the stems to resemble a chain; leaves subimbricate, slightly concave, oval-rotund, cleft one-half their length with a somewhat obtuse sinus and acute, more or less spreading divisions; leaf-cells 22–25 μ in diameter: dioicous; perianth on a short branch, 1.3 mm. long, linear-fusiform, widest below the middle, the mouth ciliolate; antheridia in he axils of the leaves of a short apical spike. Sporophyte a reddish oval-cylindric capsule borne on a short seta.

Somewhat common on the ground and on rotten wood from Newfoundland to British Columbia and probably southward, where it is often confused with the next species; also European. It was distributed by Austin in Hep. Bor. Am. 56.

5. CEPHALOZIA VIRGINIANA Spruce, On Cephalozia, 37. 1882.

Gametophyte a slender creeping whitish stem; leaves contiguous or slightly imbricate, obliquely ovate, cleft about to the middle, with acute or acuminate spreading divisions; leaf-cells isodiametric, about 22 μ in diameter: dioicous or sometimes autoicous; perianth large, linear-clavate, widest above the middle, the mouth constricted and unequally short-setulose; antheridia in the axils of the leaves of a short spike. Sporophyte an oval-cylindric reddish brown capsule on a rather long seta.

Through the kindness of Mr. Pearson I have a fragment of the type specimen described by Spruce from Portsmouth, Virginia. The species appears to be more or less widely distributed through the Southern States, but in the absence of mature perianths is distinguished with difficulty from the preceding species. It was distributed in Hep. Amer. 72.

6. CEPHALOZIA BISCUSPIDATA (L.) Dumort. Recueil d'Obs. sur les Jung. 18. 1835.

Jungermannia bicuspidata L. Sp. Pl. 1132. 1753.

Jungermannia Lammersiana Hüben. Hepaticol. Germ. 165. 1834.

Gametophyte a slender prostrate greenish leafy stem, 1–3 cm, long, flagelliferous branching; leaves distant in the basal portion. imbricate toward the apex, round-ovate, cleft to the middle or beyond, with spreading lanceolate, acute or acuminate lobes; leaf cells uniform, 30–40 μ in diameter: monoicous or in one form dioicous; perianth on a very short branch, about four times the length of the leaves, somewhat fusiform. Sporophyte cylindric-oblong on a short seta; calyptra thin; spores purple.

On rotten wood and on the ground; widely distributed from Newfoundland to British Columbia and southward along the Appalachian area; also reported from California (*Howe*); the species is also European. It was distributed by Sullivant: Musc. Alleg. 240 (as *Jungermannia bicuspidata*); by Austin: Hep. Bor. Am. 58, 59, the latter as var. *conferta*, a form with crowded leaves; and in Hep. Amer. 71. The form known as *C. Lammersiana* found in the British Possessions can hardly be maintained as distinct.

The species has been frequently figured, the best figures being Hooker, Brit. Jung. *pl. 11*, and Suppl. *pl. 4*; Ekart, Syn. Jung. Germ. *pl. 4, f. 23*; and Smith, Engl. Bot. *pl. 2239*.

7. CEPHALOZIA EXTENSA (Tayl.) Spruce, On Cephalozia, 44. 1882.

Jungermannia extensa Tayl. Lond. Jour. Bot. 5: 279. 1846.

Gametophyte a prostrate pale or rufous, sparingly branched leafy stem; leaves spreading, complicate-concave, those of the basal portion contiguous, those of the apical portion crowded, bifid more than one-half their length, with triangular-lanceolate acuminate and often apiculate divisions; leaf-cells about 35 μ in diameter: dioicous; perianth on a more or less elongated branch, linear-fusiform or sublanceolate, three times the length of the involucral leaves, which are in three or four ranks, deeply cleft and slightly longer than the ordinary stem-leaves. Sporophyte a long-stalked oval capsule, 0.7 mm. long; spores about 9 μ in diameter.

This plant was originally described from material collected by Dr. Scouler at Observatory Inlet, N. W. America and appears from present data to extend from Washington and British Columbia to northern California. It was distributed in Can. Hep. 22.

8. CEPHALOZIA PLENICEPS (Aust.) Lindb. Medd. Soc. Faun. et Fl. Fenn. 9: 158. 1883.

Jungermannia pleniceps Aust. Proc. Phila. Acad. for 1869: 222. 1869.

Cephalozia crassiflora Spruce, On Cephalozia, 40. 1882.

Gametophyte a short slender prostrate leafy stem; leaves thick, obliquely orbicular, concave, not decurrent, cleft one-fourth to one-third their length, with acute or somewhat obtuse sinus and acute lobes; leaf-cells rather large, 36–40 μ in diameter: monoicous; perianth terminal on a short branch, 2.6 mm. high, obovate-cylindric, fleshy, three cells thick at base, reduced to two cells above the middle; involucral leaves in about three ranks, ap-

pressed, fleshy, composed of two strata of cells near the base; antheridia in the axils of smaller leaves crowded in spikes. Sporophyte a short-stalked oval capsule, 0.8 mm. long, enveloped until maturity in a thin calyptra; spores about 9 μ in diameter.

The type locality of Austin's plant was in the White Mountains of New Hampshire; that of Spruce's *C. crassiflora* in the Pyrenees. It occurs on the mountains of New England and in Canada, and according to Pearson extends westward to British Columbia; also reported from California (*Howe*). It is likely to be confused with *C. media* on account of its thick perianth, which in section is found to be made up of three strata of cells at base, and two strata if the section is made higher up; *C. media* is smaller and dioicous, with strongly decurrent leaves and probably has a much wider range in both latitude and altitude. *C. pleniceps* is also reported from various parts of Europe.

9. CEPHALOZIA FLUITANS (Nees) Spruce. on Cephalozia, 50. 1882.

Jungermania fluitans Nees, in Syll. Ratisb. 129. 1823.

Cephalozia obtusilobata Lindb. Bot. Notiser, **1872**: 164. 1872.

Gametophyte a slender elongate axis, growing over *Sphagna* or semi-aquatic; leaves distant, oval, ovate or oblong, somewhat cuneate at base, bilobed one-third to one-half to the base, with a narrow acute sinus and usually obtuse lobes; leaf-cells hexagonal, 40–50 μ in diameter: dioicous; perianth on a short branch, about 3 mm. long, oval, cylindric, trigonal only at the apex; involucral leaves rather smaller than the ordinary stem-leaves, bifid to the middle, with acute lobes. Sporophyte an oblong or oblong-cylindric capsule, on a short seta; spores minutely tuberculate.

Growing in wet places, in Sphagnum bogs or semi-aquatic in the margin of pools, New Jersey and New England to Labrador and northwestward. It has been distributed by Austin in Hep. Bor. Am. 35 (as *Jungermannia inflata* var. *fluitans*) and in Hep. Amer. 154, 173.

10. CEPHALOZIA DIVARICATA (Sm.) Dumort. Hep. Europ. 89. 1874.

Jungermannia divaricata Smith, Engl. Bot. *pl. 719*. 1800.

Jungermannia byssacea Roth, Fl. Germ. **3**: 387. 1800.

Jungermannia confervoides Raddi, Mem. Soc. Mod. **18**: 29. *pl. 4. f. 1*. 1820.

Jungermannia Starkii Funck; Nees, Europ. Leberm. 2: 215, 225. 1836.

Jungermannia Grimsulana Jack; Gott. et Rabenh. Hep. Europ. No. 56.

Gametophyte a slender green olivaceous or almost black, leafy stem with leaves scarcely wider than its diameter; leaves mostly spaced, especially on sterile stems, cleft about half-way to the base, the lobes complicate or divergent, acute; underleaves mostly wanting: dioicous; perianth linear or narrowly fusiform, sometimes purple toward the base, prismatic, 3–6-angled, the mouth somewhat constricted, denticulate or nearly entire; involucral leaves larger, more or less connate, bifid, the lobes denticulate. Sporophyte an oblong-globose capsule on a short seta.

On sand and rocks and occasionally on rotten wood, New Jersey to Labrador, and on the Pacific coast from California northward; also European. It was distributed by Austin in Hep. Bor. Am. 51, 52, 53, 54; and in Hep. Amer. 155.

The species has been well figured. Besides the figures of Smith and Raddi, noted above, the more important are Hooker. Brit. Jung. *pl. 12* and Ekart, Syn. Jung. Germ. *pl. 4. f. 34.*

11. Cephalozia Macounii (Aust.) Aust. Hep. Bor. Am. no. 55. 1873.

Jungermannia Macounii Aust. Proc. Phila. Acad. for 1869: 222. 1869.

Gametophyte a short creeping more or less branched leafy stem; leaves contiguous or somewhat imbricate, broadly spreading, bifid a little beyond the middle, the lobes spreading and broadly subulate, 2–4 cells wide at base, mostly acute; leaf-cells 15–18 μ in diameter; underleaves wanting: dioicous; perianth about 0.7 mm. long, whitish, ovate-fusiform, the mouth narrowed and ciliate; involucral leaves 2 or 3 pairs, appressed, 2–3-cleft nearly one-half their length, irregularly spinulose. Sporophyte not seen.

On rotten logs, mountains of New England (Austin), Ontario and British Columbia (Macoun). The plant was distributed by Austin: Hep. Bor. Am. 55. The species is rarely collected.

12. Cephalozia Sullivantii (Aust.) Aust. Hep. Bor. Am. No. 50, 1873.

Jungermannia Sullivantii Aust. Proc. Phila. Acad. for 1869: 221. 1869.

Gametophyte an exceedingly minute mostly simple, fleshy stem, often less than a millimeter long; leaves imbricate, ovate-orbicular, usually narrower than the stem, bifid with an acutish sinus; underleaves lanceolate-ovate, entire, often apparent only near the ends of the stems; perianth terminal on ascending stems, 0.5 mm. or less long, oval or somewhat obovate, plicate and truncate at the mouth. Sporophyte an oval capsule on a seta scarcely longer than the perianth.

Among mosses on rotten wood, New Jersey and Ohio (*fide* Austin); also Belleville, Ontario (Macoun). Not often collected but likely to be overlooked by collectors on account of its almost microscopic size. It was distributed by Sullivant: Musc. Alleg. 239 (as *Jungermannia divaricata*); this number forms the type; it was also distributed by Austin: Hep. Bor. Am. 50.

13. CEPHALOZIA MINIMA Aust.; Pearson, List Can. Hep. 11. *pl. 6.* 1890.

Gametophyte a minute dark green, usually simple leafy axis; leaves about the width of the stem, obovate or subquadrate, bifid one-third their length, with acute divisions, the margins entire; leaf cells 4–6-sided, about 16 μ in diameter; underleaves present, the lower entire and subulate, the upper larger and bifid: dioicous; perianth acrocarpus, oblong-oval, with rather wide sub-entire mouth; involucral leaves 3 pairs, larger than the ordinary stem-leaves, subquadrate, bifid one-third to one-half their length, spinulose-dentate; antheridia on short branches. Sporophyte not seen.

On rotten logs, Belleville, Ontario (Macoun); known only from the type specimen.

14. CEPHALOZIA TURNERI (Hook.) Lindb. Acta Soc. Sci. Fenn. 10: 502. 1875.

Jungermannia Turneri Hook. Brit. Jung. *pl. 29.* 1816.

Gametophyte a prostrate slightly branched leafy stem, 2–5 mm. long; leaves approximate, equitant, complicate-bifid half-way to the base, the margin everywhere sharply and unequally serrate-dentate; underleaves wanting: dioicous or monoicous; perianth whitish, 0.3–0.5 mm. long, pentagonal-prismatic, the mouth almost closed, obscurely ciliolate; involucral leaves larger than the ordinary stem-leaves, spinose-dentate, bifid with acute divisions. Sporophyte and oval capsule on a slender seta; spores dark brown, about 8 μ in diameter; elaters dark brown, about 200 μ long, with two close spirals.

This species was first announced by Mr. M. A. Howe from

Marin and San Mateo counties, California,* but a scrap of it had been previously collected (1888) with *Polytrichum* by Miss M. E. Parsons, of San Rafael, and overlooked in my collection. It is found mostly on the ground and is an interesting addition to our flora. It has long been known in Europe, but does not appear to be common. It was distributed in Hep. Am. 174, from fine material sent by Mr. Howe. The species has been illustrated in Smith, Engl. Bot. *pl. 2510* and in Ekart, Syn. Jung. Germ. *pl. 9, f. 69* in addition to the citation of Hooker above.

Species dubiae et inquirendae.

CEPHALOZIA DENTATA (Raddi) Spruce, On Cephalozia, 71. 1882.

Jungermannia dentata Raddi, Mem. Soc. Mod **18**: 22. *pl. 4. f. 4.* 1818.

(This species was reported by Mitten, Jour. Linn. Soc. **8**: 52, 1865, under the name *Trigonanthus dentatus*, from Galton Mountains, British Columbia, but as it is not otherwise known from North America the identification needs to be verified.)

CEPHALOZIA CONNIVENS (Dicks.) Dumort, Recueil d' Obs. sur les Jung. 18. 1835.

Jungermannia connivens Dicks. Pl. Crypt. Brit. fasc. **4**: 19. *pl. 11. f. 15.* 1801.

Cephalozia multiflora Lindb. Acta Soc. Sci. Fenn. **10**: 501. 1875. (not Spruce *l. c.*)

(This species has been frequently reported from America but has been confused with *C. media*. It is likely to occur northward and can be distinguished from that species by its large leaf-cells (66 μ in diameter) and its perianth formed of a single layer of cells, with long ciliate mouth.)

* * *

The publication of a revision like the above is often accepted by botanical collectors as an indication that the information regarding the genus is closed. As a fact such a revision merely indicates the extent of our knowledge for the present and forms a datum line for further study. It also shows or ought to show the limitations of our knowledge. The remarks to follow apply not only to the genus *Cephalozia*, but to all genera and species of He-

* Erythea, **4**: 50. 1896.

paticae. Our knowledge of the distribution of species is very much limited. We know next to nothing of the Hepaticae of the entire range of the Rocky Mountains south of northern Idaho, and Mr. Leiberg and others who have sent in considerable quantities of interesting plants from farther north have only shown us the stores of information awaiting the collector in that region. Colorado, Utah, the Sierras from Oregon southward, and all the Southwest from Missouri to Texas, New Mexico and Arizona are a great unknown, no less among all of the lower cryptogams than in the Hepaticae. Much more needs to be done throughout all the States of the Mississippi valley, and especially the southern extension of the Appalachian area, which needs the careful attention of the resident observer, rather than the hasty notes of the transient collector. It is hoped that the above synopsis and descriptions will be sufficient to provide for any student of the group the ready means of identifying his material; we shall be pleased to receive doubtful material, or that illustrating additional facts of distribution.

NEW YORK, 24 September, 1896.

Notes on Potentilla.--IV.

BY P. A. RYDBERG.

(Plates 274 and 275.)

The *Aureae* resemble much the *Frigidae* except that the leaves have more than three leaflets. They are all low plants, generally less than 2 cm. high, except *P. dissecta*, which sometimes reaches a height of 3 cm. The pubescence is scant, silky, strigose or hirsute, only in a variety of *P. dissecta* a little tomentose on the lower surface of the leaves, and the plant often becomes glabrous and shining in age. The style in all is very slender and filiform, fastened near the apex of the achene and generally much longer than the achene. Most of the species belonging to this group have truly digitate leaves, but in the North American representatives the outer leaflets are often inserted lower down and the leaves become pinnate with approximate leaflets.

POTENTILLA RUBENS (Crantz) Vill. Prosp. Fl. Dauph. 46. 1779.

P. maculata Pourr. Act. Toloss. 3: 326. 1788.

This species comes very near the *Frigidae*, especially to *P. nana* and *P. Friesiana*. From the latter it differs little except in the number of leaflets. The leaves are much smaller than those of the other American *Aureae*, the leaflets being only 10–20 mm. long. The sepals are broadly ovate, while in the rest they are ovate-lanceolate or lanceolate. *P. rubens* grows in arctic and alpine regions of Europe, in Greenland, the Baffin Bay region and Labrador.

POTENTILLA DISSECTA Pursh, Fl. Am. Sept. 355. 1814.

P. diversifolia Lehm. Nov. Stirp. Pug. 2: 9. 1830.

It would be much better if Lehmann's name were used for this species, as this, without any doubt, belongs to it. As to *P. dissecta* Pursh, nobody seems to know absolutely what it is. Dr. Watson thought it to be the same as *P. diversifolia* Lehm. Lehmann had seen *P. dissecta* in Bank's herbarium, but thought that his *P. diversifolia* was different. Not being able to settle the matter satisfactorily, the author thinks it best for the present not to make a change in the "accepted" nomenclature, although *P. diversifolia* is a good name, and available, and besides has the advantage of belonging to this plant without any doubt.

To the author it seems as if *P. dissecta* rather belonged to *P. multisecta* (see below) or to *P. Ranunculus*. Lange's description and figure of the latter in Flora Danica, and the only specimen seen by me agrees much better with Pursh's description of *P. dissecta* than the present species does.

Dr. Watson included in his *P. dissecta*, with varieties, not less than five different plants, which I believe are all good species, viz.: *P. diversifolia* Lehm, *P. decurrens* (Wats.), *P. multisecta* (Wats.), *P. pinnatisecta* (Wats.) Aven Nelson, and *P. Drummondii* Lehm. These will be discussed further below. He also included *P. rubricaulis* Lehm.; I have not seen any authentic specimens of that. There are two forms that fairly agree with Lehmann's description and figure of *P. rubricaulis*. One differs from *P. diversifolia* Lehm. only in being smaller and with the leaves slightly whitened beneath. Following Gray and Watson, I have taken this to be *P.*

rubricaulis Lehm. and have made it a variety of the present species. I regard the other form as a new species and it will be discussed later.

P. dissecta varies much in the form of the leaves. In the type of *P. diversifolia* Lehm. the lower leaves were pinnate with approximate leaflets, but all the leaves are as often perfectly digitate. The leaflets are larger than in the other related species, oblanceolate, and generally seven in number. In the typical form they are generally appressed-hairy. All specimens seen are from the plain and mountain regions of the West, the range extending from Colorado to California, British Columbia and Saskatchewan.

POTENTILLA DISSECTA GLAUCOPHYLLA (Lehm.) Wats. Proc. Am. Acad. 7: 556. 1873.

P. diversifolia glaucophylla Lehm. Rev. Pot. 73. 1856.

Leaves nearly glabrous, glaucous-green and always digitate.

The range is the same as that of the species, but it is much more common within the United States.

POTENTILLA DISSECTA RUBRICAULIS (Lehm.).

P. rubricaulis Lehm. Nov. Stirp. Pug. 2: 11. 1830.

Leaves somewhat tomentose beneath when young. It may be a hybrid between *P. dissecta* and *P. nivea* or *P. concinna*, as it is rare and only found in the mountains, where these species also grow.

POTENTILLA DECURRENS (Wats.).

P. dissecta decurrens Wats. Proc. Am. Acad. 7: 557. 1873.

This species much resembles the preceding, especially the var. *glaucophylla*, but it is a more cespitose plant and has smaller and thicker leaves with prominent veins beneath. The leaflets are generally five and the lower often attached a little lower down and decurrent on the petioles, but this is not always the case by far. It is found in the higher moutains of Utah, Wyoming and Montana.

Potentilla Ranunculus Lange, Fl. Dan. *pl. 2964*, from Greenland, comes near to both the preceding, differing from both in the more deeply dissected leaves and scaly rootstock. The leaves resemble much those of *P. decurrens*, but are perfectly digitate and much thinner. It seems to be a very rare plant.

Potentilla ranunculoides Humb. & Bonp.; Nestl. Monog. Pot. 56, of Mexico, belongs also to this group, differing from the North American species by its large petals and very broad rounded leaflets.

POTENTILLA MULTISECTA (Wats.).

P. diversifolia multisecta Wats. King's Rep. 5: 86. 1871.

This was also included in *P. dissecta* by Watson. It is a probability that it is the original *P. dissecta* Pursh, the description of which fits this, as well as *P. Ranunculus* Lange, better than the plant for which the name is used, viz. *P. diversifolia* Lehm. From this, *P. multisecta* differs not only in the finely dissected leaves, but also in the smaller flowers. The leaves are not truly digitate, but the outer leaflets are attached a little lower, as in *P. decurrens*. All are divided into linear divisions. This species therefore connects the *Aureae* with the *Multijugae*, especially with *P. pinnatisecta* and *P. millefolia*. It ranges from Nevada to Montana and Wyoming.

A small group, nearly related to the *Aureae*, especially to *P. decurrens* and *P. multisecta*, but with the leaves more or less tomentulose beneath may be known as the *Subjugae*. The leaves are at the same time digitate and pinnate, *i. e.*, they are digitately 3–5-foliolate with a pair (in the last sometimes 2 pairs) of smaller leaflets further down on the petiole. In this respect they resemble *P. pulchella*, from which the *Subjugae* differ in the style, which is filiform. They are all low and tufted, or cespitose, delicate plants from Colorado, less than 2 dm. high, except the first, which sometimes reaches 3 dm. It approaches in size and habit the *Gracilis* group, *i. e.*, *P. gracilis* and its varieties as understood by Watson. Strangely, all four seem to be undescribed.

POTENTILLA SUBJUGA n. sp.

Tufted from a perennial root; stems many, 1–3 dm. high, silky-villous, few-leaved, rather divergently branched above, the lower portion covered with the brown scarious lower stipules; upper stipules green, ovate, entire. Basal leaves many, digitately 5-(seldom 3-) foliolate with an additional pair of smaller leaflets on the petiole, about 1 cm. below the others; leaflets 1–4 cm. long, oblong or obovate, deeply incised into oblong rather obtuse segments, silky and green above, silky and white-tomentose beneath; stem-

leaves generally ternate, few and reduced in size; calyx silky-hirsute, in fruit 5–8 mm. in diameter; bractlets oblong, obtuse or acute, about ⅓ shorter than the ovate triangular acuminate sepals; petals broadly obcordate exceeding the sepals; stamens about 20; style filiform, nearly terminal; achenes smooth. (Plate 274.)

As before noted it resembles somewhat the species of the *Gracilis* group, especially *P. fastigiata* in size and *P. pulcherrima* in the form of the leaflets and the pubescence. The latter has digitate or more or less pinnate leaves with approximate leaflets, but they are never, as in *P. subjuga*, digitately 5-foliolate with a pair of smaller ones some distance below. In *P. subjuga*, the leaflets are more deeply incised and the stem and branches stricter and the latter rather divergent; they are few-flowered,* as in *P. nivea*, from which it differs in the number of the leaflets.

Colorado: N. H. Patterson, no. 192, 1892 (from near Empire, type); 1885 (from Gray's Peak); C. S. Crandall, no. 184, 1892 (from Graymont); T. C. Porter, no. 44; Hall and Harbour, no. 160, 1862, mainly.

POTENTILLA TENERRIMA n. sp.

Tufted from a perennial root; stems many, very slender, generally tinged with red, 1–1½ dm. high, sparingly strigose; stipules linear, lanceolate, acuminate, about 1 cm. long, the lower scarious and brown. Leaves digitately 3-foliolate, with a pair of smaller leaflets below, or, which is the same, pinnate of 2 pairs and terminal leaflet sessile, finely silky and a little grayish tomentulose beneath; leaflets obovate or oblanceolate in outline, divided to near the midrib into linear acute segments; flowers on slender pedicels, nearly 1 cm. in diameter; calyx silky-strigose, in fruit ½ cm. in diameter; bractlets linear, acute, very little shorter than the narrowly lanceolate sepals; petals obovate, slightly retuse, a little exceeding the sepals; stamens about 20; style filiform, nearly terminal; achenes smooth. (Plate 275, figs. 1–5).

It resembles a very slender form of the preceding, but the terminal leaflets, as in the two next, are always only three. The segments of the leaflets are also much narrower, as also the bracts and sepals, which are narrower than in any other North American species.

Colorado: Brandegee, no. 950, 1874 (from Bergen's Park, type); Hall and Harbour, no. 160 (in part, in the Harvard herbarium).

* *P. rubricaulis* Lehm. may perhaps be a form of this with only 3 terminal leaflets and more erect branches.

POTENTILLA MINUTIFOLIA n. sp.

Cespitose, stems about 1 dm. long, slender, 1–2-leaved, sparingly silky or nearly glabrous, slightly striate; stipules ovate-lanceolate, the lower scarious and brown; basal leaves very small, on slender petioles 3–5 cm. long, silky-hirsute, slightly grayish beneath, pinnate, of two pairs of leaflets, the upper pair and the sessile odd leaflet about ½ cm. long; the lower pair only 2–3 mm.; leaflets obovate, incised, with oval rounded segments; flowers 1–2, about 15 mm. in diameter; calyx sparingly hirsute, in fruit 7–8 mm. in diameter; bractlets oblong, generally obtuse, about half as long as the oblong-lanceolate obtuse or acutish sepals; petals obcordate, about ½ longer than the sepals. (Plate 275, figs. 6–10.)

This somewhat resembles *P. subjuga*, but differs in the small size of the plant and of the leaves, the three terminal leaflets, and their short and rounded segments.

Colorado: Wm. M. Canby (Pikes Peak) 1895.

POTENTILLA SAXIMONTANA n. sp.

Densely cespitose; stems several, 1–3-flowered, less than 5 cm. long, silky pubescent. Basal leaves numerous, pinnate with 2–3 often approximate pairs of leaflets, silky pubescent and somewhat tomentose beneath, short-petioled; leaflets deeply dissected into oblong obtuse or acute segments; flowers about 1 cm. in diameter; calyx densely silky; bractlets oblong, obtuse, shorter than the broadly ovate-triangular sepals; petals broadly obcordate, much longer than the sepals; stamens about 20; style nearly terminal, about equalling the smooth achene.*

It somewhat resembles the preceding, but is still more cespitose, has much broader sepals and larger leaves, which have much shorter petioles. The leaves resemble somewhat those of *P. pinnatisecta* (Wats.) Aven Nelson (*P. ovina* Macoun), but are slightly tomentose. The flowers are much larger and the sepals much broader than in that species. It resembles also somewhat *P. Sommerfeltii*, but has much more dissected leaves, and the style is different. The following specimens have been examined:

Colorado: John Wolf, no. 366, 1873 (Wheeler's expedition, type); Hooker & Gray, 177 (Torrey's Peak); Knowlton, no. 19, 1896 (Pike's Peak).

* The plate of this will appear in a subsequent number.

Notes on the Pine-inhabiting Species of Peridermium.*

By Lucien M. Underwood and F. S. Earle.

There seems to have been much confusion regarding the pine-inhabiting species of *Peridermium* not only in this country but also in Europe, and the difficulties in the way of a clear understanding of the species have not been entirely removed. So far as we have been able to discover we have only three species of this group in the eastern United States besides three nominal species from western North America which we have not been able to examine.† It is possible that the examination of the type of another Eastern species (now inaccessible for the time) may reveal some features that its description does not show and require further modification of the synonymy.

Two of our species are foliicolous and produce only a minimum of disturbance in the tissues of their host, while the third is found only on stems producing extensive gall-like swellings often of enormous size. These may appear on the smaller limbs, or on branches of various sizes, or on the main trunk of trees of considerable diameter. So far as the economic relations are concerned, the foliicolous species rarely produce any considerable damage, but the stem-inhabiting species causes extensive damage in some portions of the South in the deterioration or death of chiefly young pines. The Eastern species are as follows:

1. Peridermium acicolum (Wallr.).

P. pini var. *acicolum* Wallr. Fl. Crypt. 262. 1833.

P. oblongisporium Fuck. Symb. Mycol. 42. 1869.

This species, which is very distinct from the stem-inhabiting *Peridermium pini* of Europe, appears to be confined to the Northeastern states and is not separable from the forms occurring in Europe on various hosts. With us it has been found only on *Pinus rigida*. We have seen specimens from Massachusetts (Underwood, Seymour) and New Jersey (Pennypacker) only. The spores are

* Read before Section G, A. A. A. S., Buffalo meeting, August, 1896.

† *P. Englemanni* Thuem., from Colorado; *P. filamentosum* Peck, from Arizona and *P. Harknessii* Moore, from California.

large, usually oval, often reaching 40 μ; the peridial cells form a thin tenacious membrane and do not readily separate from one another when placed in dilute potash; their ends are usually rounded, but are sometimes obliquely truncate, imbricate or occasionally in rows placed end to end; they are somewhat intermediate in this respect between our other two species.

Exsicc. Ellis & Everhart. N. A. Fungi, 2222; Seymour & Earle, Economic Fungi, 223.

The above species has been confused with *P. pini*. Wallroth was the first to distinguish it as a foliicolous variety, while Fuckel made it a distinct species. Unless we are to recognize only one pine-inhabiting *Peridermium* which is clearly illogical, we must maintain this as a distinct species. If we are to follow in the lead of some of the highly imaginative fungiculturists, some of whom maintain that this form is the aecidial stage of a *Cronartium*, while *P. pini* is similarly regarded as the corresponding stage of a *Coleosporium*, the two must be at least specifically distinct, since in their mature stage they would belong to two totally different genera! Winter singularly unites them in one species without even maintaining a varietal distinction.

2. PERIDERMIUM ORIENTALE Cooke, Indian Forester, 3: 91.

With some hesitation we refer the large leaf-inhabiting species of the Southern States to this name, originally described from northern India. In this we are supported by three somewhat questionable principles: (1) A writer is supposed to know his own species (a principle, however, which does not always follow) and the specimens issued in Ravenel's Fungi Amer., cited below, were doubtless examined by Cooke, who was the author of the species in question; (2) There is little in the description of the species as quoted in Saccardo that would stand in the way of such a reference; and (3) The species has commonly been referred to this name by American authors. While, therefore, it seems hardly probable that there should be a species of *Peridermium* common to two such remote localities as India and the southern United States, and while the original specimen may, in the light of characters now recognized that are not touched upon in the original

description, prove totally distinct, it seems hardly wise to us to establish a new species without first seeing the type of the one to which it has been referred. On this principle of *laissez faire* we retain with some mental reservations the above name.

This species seems to have a wider range of host plants as well as a greater geographic distribution than the preceding. We have examined specimens as follows:

On *Pinus taeda*. Georgia (Ravenel, Underwood); Alabama (Underwood & Earle).

On *Pinus palustris*. South Carolina (Ravenel); Florida (Martin, Underwood); Alabama (Earle & Underwood); Mississippi (Earle & Tracy).

On *Pinus* sp. Missouri (J. G. Barlow).

This handsome species is quite abundant in the Southern States, and while found more commonly on comparatively young trees it frequently appears on trees of considerable size. It was first distributed by Ravenel as *Aecidium pini* of which he curiously gives *Peridermium pineum* Schw. as a synonym, notwithstanding Schweinitz alludes distinctly to the peculiar gall-like growths that are discussed under the following species. Later Ravenel distributed the same thing under the name of *P. orientalis* [*sic*] Cooke.

The spores are small, rotund or broadly oval, and like the peridial cells, thickly beset with long weak obtuse spines; in size they are variable, averaging 20 μ. The peridial cells approach rectangular, are truncate and placed end to end, are variable in size, averaging about 40 by 25 μ, and readily separate from one another; they are thickly beset with long, obtuse echinulations, which, when seen from above, give the appearance on a casual examination of being radiate-striate on the margin.*

Exsicc. Ravenel. Fungi Carol. fasc. 1, no. 93 (as *Aecidium pini*).

Ravenel. Fungi Amer. 270.

Ellis. N. A. Fungi, 1026.

Seymour & Earle. Economic Fungi, 224 (as *Peridermium pini* var. *acicolum*).

* This character is common to all the species of *Peridermium* we have examined, though it seems to have been overlooked, since the peridial cells are usually described as wrinkled or striate margined. The echinulations are unusually long and conspicuous in this species.

3. PERIDERMIUM CEREBRUM Peck, Reg. Rep. **25**: 91. 1873.

Peridermium pineum Schw. Trans. Amer. Phil. Soc. **4**: 294. 1835. Not Lk.

? Peridermium pyriforme Peck, Bull. Torr. Bot. Club, **6**: 13. 1875.

This stem-inhabiting species was first mentioned by Schweinitz in Syn. Fung. Carol. *No. 456* and afterward in Syn. Fung. Bor. Am., where he describes it as follows: "In Pennsylvania prope Philadelphia et alibi non rarum. Specimina ampla, pedalia in ipso trunco Pini inopis mihi obvia, analogon praebuerunt Gymnosporangis juniperini." Later the species was collected by Lintner at Center, New York, on *Pinus rigida* and described by Peck as *Peridermium cerebrum*. Professor Peck informs us that the species is not common in eastern New York. We have seen the type specimen, which is not different from the forms common about Washington on *Pinus Virginiana* and farther south on *P. echinata*, except that the gall is larger in proportion to the size of the stem.

Peck described later a second species sent him by Ellis either from New Jersey or Georgia. Of this we have not been able to see the type, but its striking characteristic of pyriform spores mentioned in the description we have found in both forms of *P. cerebrum* as they occur in the South. A form distributed by Ellis, N. A. Fungi, 1021, "On seedlings of *Pinus inops* Ait," shows microscopic characters similar to this species, but in the set examined the fungus appears to make only a slight swelling and that totally unlike the normal one produced on *P. Virginiana*. There may have been some error in the determination of the host. This matter has been left for later consideration.

Specimens have been examined as follows:

On *Pinus rigida*, New York (Peck); New Jersey (Ellis); Massachusetts. (Underwood); the last named specimen was in the form of a convex swelling at the base of a large tree; the others are of the typical globose form.

On *Pinus Virginiana*. Virginia (Galloway); Alabama (Underwood); to these should be added the Schweinitzian reference to Pennsylvania above cited; all these forms are of the globose type.

On *Pinus echinata*. Alabama (Earle & Underwood). These are also of the globose type.

On *Pinus taeda*. Alabama (Underwood & Earle); Mississippi (Tracy). These are of the fusiform type described below.

On *Pinus sp*. Webster County, Mississippi (W. B. Stark). Also of the fusiform type, though represented only by fragments.

In microscopic characters this species is related to the European *Peridermium pini* (P.) Wallr., but sufficiently distinct. The spores are of medium size, 20–30 μ long, irregularly oval, ovate or pyriform; the peridial cells are long and narrow, with pointed ends, arranged imbricately and never end to end; they are about 40–60 μ by 15–20 μ and do not readily separate from one another in dilute potash.

Exsicc. Ellis, N. A. Fungi. 1022.

We have observed the development of the globose type on *Pinus echinata* in central Alabama, where it is very common and causes considerable damage among the pines. It frequently appears as globose swellings less than two centimeters in diameter, on small twigs, and often during its early stages of growth no spores are developed. The mycelium is perennial and later produces conspicuous yellow peridia, which are often arranged so as to form convolutions giving a resemblance to the surface of the brain. Within these, spores are produced in prodigious quantities. Unless the branch is killed, the parasite continues to grow for a succession of seasons, producing more spores each season. Usually the gall entirely surrounds the branch, but in some cases the branch escapes with only one side affected. Occasionally the main trunk will be first affected and, continuing to grow with its gall, will form a large ball a foot or more in diameter. Since the plant is perennial the necessity of an alternate host is not immediate, and it will be a matter of future investigation as to what becomes of the spores. Some source of infection must be at hand, since the parasite is very abundant in the South, some considerable areas in eastern Alabama showing nearly every tree of the species more or less affected.

On *Pinus taeda* the form of the gall is entirely different. Instead of a globose type, which occurs on the other hosts, we have an elongate fusiform enlargement of the branch almost uniform

in every direction, so as to produce an almost perfect spindle. So far as we can discover, there are no microscopic differences between this form and the globose type, either in the spores or peridial cells, both showing the same characters and the same variations. The difference in the gall, however, is so marked and so constant, and the parasite on both pines is so common, that the shape of the gall often serves as a ready means of identifying the trees at a glance. Occasionally larger trunks will be affected, and then the gall retains its typical elongate character instead of the rounded convex forms that appear on *Pinus echinata* in the South, and that we have seen on *Pinus rigida* as far north as Massachsetts. The occurrence of such marked macroscopic characters opens up an interesting question as to how much weight should attach to what may be called "habit characters." Shall they be disregarded, shall they be recognized as varietal differences, or shall they serve as specific characters of equal weight with those which require a microscope to detect? We have provisionally adopted the first course in the present case.

AUBURN, ALABAMA, July, 1896.

Studies in the Botany of the southeastern United States—VII.

BY JOHN K. SMALL.

RUMEX LANGLOISII n. sp.

Perennial, glabrous, somewhat scurfy, dark green (when dry). Stem erect or ascending, 5–7 dm. tall, simple or with a few nearly erect branches, more or less flexuous, at length strongly furrowed; leaves oblong or linear-oblong, 3–12 cm. long, acuminate or acutish, erose crenulate, slightly crisped, somewhat prominently nerved especially beneath, narrowed into a petiole which is usually 1 or 2 cm. long; ocreae very thin, early falling away; panicle rather open, not leafy, 1–2 dm. long; racemes strongly ascending, 5–10 cm. long, usually interrupted; flowers about 2 mm. long, in dense whorls (in fruit); pedicels about 5 mm. long, articulated near the base, enlarged towards the end; wings rather coriaceous, deltoid, 4 mm. long, the sides rounded, the apex blunt, the surface prominently nerved, each bearing a papillose calosity 1 mm. broad and 3 mm. long; achene ovoid, nearly 3 mm. long, abruptly contracted into a very short base, slightly acuminate at the apex, the faces dark red, the angles slightly paler and margined.

Southern Louisiana, New Orleans (Joor, according to Trelease) and Pointe a la Hache (Langlois).

This is *Rumex Floridanus* Trelease, but not *R. Floridanus* Meisner. With the original specimens of *R. Floridanus* Meisner at hand I cannot separate them from *R. verticillatus*, to which Meisner says the species is closely related. Prof. Trelease has given the plant its correct position, but referred it to the wrong species. *R. Langloisii* is intermediate between *R. verticillatus* and *R. altissimus* in these respects: its inflorescence suggests the latter, while its foliage suggests that of the former.

POLYGONELLA Michx. Fl. Bor. Am. 2: 240. 1803.

[LYONIA Raf. Med. Repos. N. Y. 5: 352. 1808.]
[STOPINACA Raf. Fl. Tellur. 3: 11. 1836.]
[GONOPYRUM F. & M.; C. A. Meyer, Mem. Acad. St. Petersb. (VI.) 4: 144. 1840.]

Key to the Species.

Flowers polygamo-dioecious; filaments subulate or filiform, nearly alike or some slightly dilated at base; embryo axial
- Ocreae fringed with a few bristle-like cilia. — 1. *P. ciliata.*
- Ocreae naked.
  - Leaves 1–5 mm. broad.
    - Achenes rhomboidal; leaves filiform-subulate. — 2. *P. brachystachya.*
    - Achenes ovoid or oblong-ovoid; leaves wedge-shaped or spatulate.
      - Stems branched above; outer calyx-segments not reflexed. — 3. *P. gracilis.*
      - Stems diffusely branched at the base; outer calyx-segments reflexed. — 4. *P. polygama.*
  - Leaves 5–25 mm. broad. — 5. *P. macrophylla.*

Flowers perfect; filaments dissimilar, the inner conspicuously dilated; embryo near one of the faces of the endosperm.
- Annual; outer calyx-segments not reflexed, the inner not becoming conspicuously larger than the outer. — 6. *P. articulata.*
- Perrennial; outer calyx segments reflexed; the inner developing large wings. — 7. *P. Americana.*

1. POLYGONELLA CILIATA Meisn. in DC. Prodr. 14: 81. 1856.

Vicinity of the Manatee river, Florida.

As late as the year 1894 there seems to have been only one collection of the above species; this was Rugel's 429, on which

Meisner based the species. In August, 1895, Mr. Nash collected specimens at Palmetto, Manatee county, Florida (no. 2429). This second station is in the vicinity of the original station. The geographic range of *Polygonella ciliata* seems to be very restricted.

2. POLYGONELLA BRACHYSTACHYA Meisn. in DC. Prodr. **14**: 80. 1856.

Polygonella Croomii Chapm. Fl. S. States, 387. 1860.

As far as I can see, these two species must be united. Having the types of both at hand I cannot find any distinctive characters and in addition the labels show that *Polygonella Croomii* is from "South Florida," and not from "Carolina or Georgia," as Dr. Chapman records in the Flora of the Southern United States.

3. POLYGONELLA GRACILIS (Nutt.) Meisn. in DC. Prodr. **14**: 80. 1856.

Polygonum gracile Nutt. Gen. **1**: 256. 1818.

Polygonum setaceum Nutt.; Meisn. in DC. Prodr. **14**: 80. 1856.

Sand hills, South Carolina to Florida and Louisiana.

4. POLYGONELLA POLYGAMA (Vent.) A. Gray, Bost. Journ. Nat. Hist. **5**: 231. 1847.

Polygonum polygamum Vent. Hort. Cels, *pl. 65*. 1800.

Polygonella parviflora Michx. Fl. Bor. Am. **2**: 241. 1803.

Atraphaxis dioica Bosc; Meisn. in DC. Prodr. **14**: 80. 1856.

Polygonella parvifolia var. *subenervis* Meisn. in DC. Prodr. **14**: 80. 1856.

Dry, sandy soil near the coast, from North Carolina to Florida.

5. POLYGONELLA MACROPHYLLA n. sp.

Perennial (?), stoutish, glaucous, glabrous. Stem solitary, erect, 8 dm. tall, simple below, branched above; leaves obovate or oblanceolate, 2–6 cm. long (sometimes shorter on the branchlets), obtuse, 3–5-nerved, leathery, exceeding the internodes except on the upper part of the stem; ocreae cylindric, slightly oblique, not pointed, increasing in length toward the upper part of the stem; racemes very dense, 2–3 cm. long, disposed in ovoid panicles; ocreolae funnelform, densely imbricated, slightly pointed; pedicels jointed at the middle; calyx (flowering stage not seen), the outer segments slightly accrescent, the inner developing wings; filaments subulate, somewhat dilated at the base; style 3-parted to

the base; wings oblong, 4 mm. long; achene 3-angled, narrowly oblong, acuminate at both ends, 4 mm. long, brown.

"Sandhills near the coast, Florida, A. W. Chapman."

Strikingly different from anything heretofore described in the genus but related to *Polygonella polygama*. It differs from all its relatives in its stout build, wand-like stem and remarkably large leaves for the genus.

6. POLYGONELLA ARTICULATA (L.) Meisn. Gen. 2: 228. 1836-43.

Polygonum articulatum L. Sp. Pl. 363. 1753.

Sandy beaches along the Atlantic coast from Maine to Florida and along the Great Lakes.

7. POLYGONELLA AMERICANA (F. & M.) Small, Mem. Torr. Club, 5: 141. 1894.

Gonopyrum Americanum F. & M. Mem. Acad. St. Petersb. (VI.) 4: 144. 1840.

Polygonella ericoides Engelm. & Gray, Bost. Journ. Nat. Hist. 5: 230. 1847.

Polygonella Meisneriana Shuttlw.; Meisn. in DC. Prodr. 14: 81. 1856.

Sandy soil, Missouri to Georgia, south to Alabama and Texas.

With the two excellent specimens from which Meisner drew his original description, to compare with a generous supply of *Polygonella Americana* and observations in the field, I cannot separate *Polygonella Meisneriana* from *P. Americana*. There may be two species in what is now included in the latter species, but the separation must be on different lines.

THE GENUS WAREA.

I have always been impressed with the remarkably inconsistent descriptions that have been applied to the plant we have known as *Warea amplexifolia*. The discovery, by Mr. Nash, of a third species of *Warea* in western Florida renewed my interest in the group and led me to investigate it. The facts seem to be as follows: In 1822 Nuttall described *Stanleya? amplexifolia*,* founding the species on a specimen from eastern Florida. This plant had amplexicaul leaves. In 1834 Nuttall founded the genus

* Am. Journ. Sci. 5: 297.

Warea,* making the type a *Warea amplexifolia* founded on a plant from western Florida. This plant had sessile leaves, according to the author and his plate. Nuttall was not as shrewd as usual, and failing to see that his *Warea amplexifolia* was different from *Stanleya amplexifolia*, combined the original description of *Stanleya amplexifolia* with that of *Warea amplexifolia*; this blunder has been followed to the present day and consequently the ambiguous descriptions.

The plant from eastern Florida has been represented in our herbaria by good and ample specimens while only a few fragments of the west Florida plant seem to be extant, but now that we are furnished with excellent material the specific lines appear very distinct. I append a synopsis of the genus.

WAREA Nutt. Journ. Acad. Phila. 7: 83. *pl. 10.* 1834.

Key to the Species.

Leaves narrowly cuneate at the base; claws of the petals pectinate-fimbriate. 1. *W. cuneifolia.*

Leaves rounded or auricled at the base.

Leaves sessile, not auricled at the base; claws of the petals granular-toothed. 2. *W. sessilifolia.*

Leaves clasping, auricled at the base; claws of the petals serrulate. 3. *W. amplexifolia.*

1. WAREA CUNEIFOLIA (Muhl.) Nutt. Journ. Acad. Phila. 7: 84. 1824.

Cleome cuneifolia Muhl. Cat. 61. 1813.

Stanleya gracilis DC. Syst. 2: 512. 1821.

Cleome laevigata Soland.; DC. Syst. 2: 512. As synonym. 1821.

Sand hills, Georgia to Florida, near the coast.

2. WAREA SESSILIFOLIA Nash, Bull. Torr. Club. 23: 101. 1896.

Warea amplexifolia Nutt. Journ. Acad. Phila. 7: 83. *pl. 10.* 1834. Not *Stanleya amplexifolia* Nutt.

Sandhills, West Florida at about 100 feet above sea-level.

3. WAREA AMPLEXIFOLIA (Nutt.)

Stanleya amplexifolia Nutt. Am. Journ. Sci. 5: 297. 1822.

Sand hills, East Florida, near sea-level.

CARDAMINE ARENICOLA Britton, Bull. Torr. Club, 19: 220. 1892.

This has been found by Prof. Scribner growing in sand and

* Journ. Acad. Phila., 7: 83. *pl. 10.*

shaly soil about Knoxville, Tennessee. It is also plentiful in the sandy summit of Little Stone Mountain, Georgia.

EUPHORBIA HUMISTRATA Engelm.; A. Gray, Man. Ed. 2. 386. 1856.

The known geographic ranges of the above species has lately been greatly extended southward by collections from Mississippi Professors. Tracy and Earle found it on Horn Island (2886) and at Biloxi (2913).

The name *Gatesia* cannot be applied to the Acanthaceous genus of the southern United States, with which it has lately been associated, having previously been used for an entirely different plant. I take pleasure in using in this connection the name of Prof. W. S. Yeates, State Geologist of Georgia, for while on his survey I first met this rare and peculiar species along the Flint river, in southwestern Georgia. Previously it had not been known to occur east of Alabama.

YEATESIA.

[GATESIA A. Gray. Proc. Am. Acad. 13: 365. 1878. Not Bertol. 1848.]

YEATESIA LAETE-VIRENS (Buckl.).

Justicia laete-virens Buckl. Am. Journ. Sci. **45**: 176. 1843.

Rhytiglossa viridiflora Nees, in DC. Prodr. **11**: 346. 1847.

Dicliptera Halei Ridd. New Orleans Med. Journ. 1852.

Gatesia laete-virens A. Gray, Proc. Am. Acad. **13**: 365. 1878.

Justicia viridifolia Buckl.; Nees in DC. Prodr. **11**: 346. As synonym. 1847.

Tennessee to Georgia, Florida and eastern Texas.

VIBURNUM RUFOTOMENTOSUM.

Viburnum prunifolium var. *ferrugineum* T. & G. Fl. N. A. **2**: 15. 1841.

Viburnum ferrugineum Small, Mem. Torr. Club, **4**: 123. *pl. 78.* 1894. Not Raf. 1838.

Viburnum prunifolium is said to grow as far south as Mississippi and Florida, but during all my travels in the Southeast I have not met with the species. *Viburnum rufotomentosum* seems to replace our common plum-leaved *Viburnum* in the Southern States. The most southern station at which I have collected *V. prunifolium* is Salisbury, North Carolina.

New Species of Fungi.

By Chas. H. Peck.

Lepiota mutata.

Pileus thin, convex, subumbonate, slightly scabrous on the disk, white, changing to brown on the disk in drying; lamellae close, thin, subventricose, free, white; stems slender, equal, hollow, white; the annulus slight, sometimes evanescent; spores elliptical, .0003 to .0004 in. long, .0002 to .00024 broad; pileus 1 to 1.5 in. broad; stem about 1 in. long 1 to 2 lines thick.

Ground in woods. Kansas. July. E. Bartholomew.

In the fresh condition this plant is entirely white, but in the dried specimens the umbo or disk has become brown. This change in color suggests the specific name. In the other white species, *L. erminea* and *L. alba*, the spores are longer, and in *L. Miamensis* and *L. subremota* the pileus is scaly.

Clitocybe subsocialis.

Pileus fleshy, convex, becoming somewhat depressed centrally, minutely squamulose, pale tawny or subrufescent, flesh white, taste and odor nauseous; lamellae subdistant, decurrent, white, the interspaces venose; stem equal, solid, colored like the pileus, having a white mycelioid tomentum at the base; spores subelliptical, .00024 to .0003 in. long, .00016 to .0002 broad, slightly apiculate at one end and usually containing a shining nucleus; pileus 6 to 18 lines broad; stem 1 to 2 in. long, 1 to 2 lines thick.

Grassy ground. Camas, Washington. December. F. C. Yeomans.

The species is apparently closely allied to *Clitocybe socialis*, from which it differs in its strong odor, squamulose pileus and white lamellae. It also approaches *C. sinopica* and *C. infundibliformis* in color, but in both these the pileus is also glabrous. The squamules are somewhat granular in appearance.

Omphalia luteola.

Pileus thin, convex or sub-hemispherical, glabrous, centrally depressed or broadly umbilicate, buff-yellow; lamellae few, 10–15, distant, decurrent, pallid; stem slender, glabrous, solid, brown, with white mycelium at the base; spores subelliptical, .00024–.00028 in long, about .00016 broad, commonly uninucleate; pileus 2–4 lines broad; stem about 6 lines long, .5 thick.

Decaying wood of fir trees. Camas. February. Yeomans.

The small size, buff pileus solid stem and pallid lamellae are the distinguishing features of this species. It is closely related to *O. Campanella*, but the paler colors of the pileus and lamellae and the white mycelium will separate it. The stem appears to be solid, but it is possible that in fully mature specimens there may be a small cavity.

LACTARIUS LUTEOLUS.

Pileus fleshy, rather thin, convex or nearly plane, commonly umbilicately depressed in the center and somewhat rugulose, pruinose or subglabrous, buff color, flesh white, taste mild, milk copious, flowing easily, white or whitish; lamellae close, nearly plane, adnate or slightly rounded behind, whitish, becoming brownish where wounded; stem short, equal or tapering downward, solid, but somewhat spongy within, colored like the pileus; spores globose, .0003 in. broad; pileus 2–3 in. broad; stem 1–1.5 in. long, 3–5 lines thick.

Dry woods. East Milton, Massachusetts. August. H. Webster.

This species is related to *Lactarius volemus* and *L. hygrophoroides*, but its smaller size and short stem will distinguish it from the former and its close lamellae from the latter. Its paler buff color will separate it from both. Some specimens have a narrow encircling furrow or depressed zone near the margin and a slightly darker shade of color on the margin. The milk constitutes a remarkable feature of the species. According to the notes of the collector it is exceedingly copious, rather sticky, serous in character with white particles in suspension. It flows from many points as soon as the plant is disturbed and it stains the gills. It is impossible to collect an unstained specimen, so free is the flow of the milk. He says, "I have never succeeded in picking a specimen so quietly as to prevent an instant and copious flow of its milk."

RUSSULA SUBDEPALLENS.

Pileus fleshy, at first convex and striate on the margin, then expanded or centrally depressed and tuberculate-striate on the margin, viscid, blood-red or purplish red, mottled with yellowish spots, becoming paler or almost white with age, often irregular, flesh fragile, white, becoming cinereous with age, reddish under the cuticle, taste mild; lamellae broad, subdistant, adnate, white

or whitish, the interspaces venose; stem stout, solid but spongy within, persistently white; spores white, globose, rough, .0003 in. broad; pileus 3–6 in. broad; stem 1.5–3 in. long, 6–12 lines thick.

Under a hickory tree. Trexlertown, Pennsylvania. June. W. Herbst.

Closely related to *Russula depallens*, from which it differs in having the margin of the pileus striate at first and more strongly so when mature, also in the pileus being spotted at first, the lamellae more distant, the stem persistently white and the spores white.

MARASMIUS GREGARIUS.

Pileus submembranous, glabrous, centrally depressed or broadly umbilicate, striatulate when moist, bay-brown or pale alutaceous, a little darker in the center; lamellae narrow, subdistant, adnate, some of them branched, whitish; stem short, slender, inserted, hollow, flocculose or almost pubescent, pale bay-brown, a little darker toward the base; spores subglobose, about .00016 in. broad; plant gregarious; pileus 4 to 6 lines broad; stem 4 to 6 lines long, about .5 line thick.

Decorticated wood. Mammoth Cave, Kentucky. June. C. G. Lloyd.

PANUS BETULINUS.

Pileus thin, suborbicular or dimidiate, nearly plane, glabrous, prolonged behind into a short stem, grayish-brown, darker or blackish toward the stem; lamellae narrow, close, decurrent, whitish; stem adorned with a slight tawny hairiness which is more fully developed toward the base; spores minute, .00016 to .0002 in. long, .00006 to .00008 broad.

Decaying wood of birch. Newfoundland. October. Rev. A. C. Waghorne.

LENTINUS MAGNUS.

Pileus thick, hard, convex, slightly depressed in the center, glabrous, dingy-white, the surface cracking into broad areolae or scales, margin involute, flesh whitish; lamellae broad, close, thick, slightly decurrent, coarsely dentate or lacerate on the edge, pallid; stem stout, hard, solid, squamose, slightly thickened at the base, colored like the pileus; spores oblong-elliptical, .0003 in. long, .00015 broad; pileus 6 in. or more broad, stem about 4 in. long, 1 in. or more thick.

Gregarious on ground abounding in humus. Mount San Antonio, California. August. Prof. A. J. McClatchie.

This large species was found at an elevation of 10,000 feet. It is well marked by the peculiar areolate and scaly cracking of the surface of the pileus. The scales of the stem are similar to those of the pileus. The lamellae are thicker than those of *Lentinus lepideus* and the spores are smaller. The scales are concolorous, not spot-like, as in that species.

LENTINUS UNDERWOODII.

Pileus fleshy, tough, convex or nearly plane, the glabrous surface cracking into areola-like scales which are indistinct or wanting toward the margin, whitish or slightly tinged with buff or pale ochraceous, flesh white; lamellae moderately close, decurrent, slightly connected or anastomosing at the base, somewhat notched on the edge, whitish, becoming discolored in drying; stem stout, hard, solid, eccentric, squamose, colored like the pileus; spores oblong, .0005–.0006 in. long, .0002–.00025 broad; plant caespitose; pileus 3–6 in. broad; stem 1.5–3 in. long, about 1 in. thick.

Wood of oak. Tuskegee, Alabama. July. Prof. L. M. Underwood.

This differs from *L. magnus* in its caespitose habit, eccentric stem, longer spores, less distinctly areolate-squamose pileus and in its habitat. The lamellae are connected at the base very much like those of *Pleurotus ostreatus*.

LENTINUS VENTRICOSUS.

Pileus fleshy, nearly plane above, glabrous, shining, white, the thin margin involute, flesh whitish; lamellae narrow, close, decurrent, serrate on the edge, whitish; stem short, thick, ventricose, smooth, solid, abruptly narrowed or pointed at the base, annulate, white, tinged within with isabelline; spores .0004 to .0005 in. long, .0002 to .00024 broad; pileus 4 to 6 in. broad; stem 1.5 to 2 in. long, nearly as broad in the thickest part.

Auburn, Alabama. December. Underwood.

A species well marked by its white glabrous pileus and its short ventricose annulate stem.

PHOLIOTA SABULOSA.

Pileus convex or nearly plane, glabrous, pale yellowish-brown; lamellae adnate, subdistant, yellowish-brown; stem short, equal or slightly tapering downwards, hollow, colored like or a little paler than the pileus, paler above the slight subevanescent annulus; spores subelliptical, brownish-ferruginous, .0003 to .0004 in. long,

.0002 to .00024 broad; pileus 9 to 12 lines broad; stem about 1 in. long, 1 to 2 lines thick.

Sandy soil. Alabama, December. Underwood.

In the dried specimens the pileus is pale-tawny and the lamellae are brownish ferruginous.

Flammula Underwoodii.

Pileus convex or nearly plane, often irregular from its crowded mode of growth, squamulose or furfuraceous, yellowish-brown; lamellae rather broad, close, adnate or slightly decurrent, yellow; stem tapering downward, radicating, longitudinally streaked with brownish hues, yellow at the top; spores elliptical, ochraceous, .00024 to .0003 in. long, .00016 to .0002 broad; plant caespitose; pileus 1 to 4 in. broad; stem 2 to 4 in. long, 3 to 6 lines thick.

Pine trunks. Alabama, November. Underwood.

The species is apparently related to *Flammula sapineus*, from which its densely caespitose habit and brownish streaked stem will easily separate it.

Galera semilanceata.

Pileus membranous, acutely conical or campanulate, often sharply umbonate, glabrous, sulcate-striate, pale-yellow or buff; lamellae rather broad, ascending, distant, adnate, tawny-ferruginous when mature; stem slender, glabrous, hollow, pallid; spores elliptical, ferruginous, .0004 to .0005 in. long, .0002 to .00024 broad; pileus 4 to 6 lines broad; stem 1.5 to 2 in. long, .5 to 1 line thick.

Among fallen leaves, sticks, mosses, etc. Washington. December. Yeomans.

Mr. Yeomans remarks that this plant in size, shape and color corresponds very closely to Cooke's figure of *Psilocybe semilanceata*, but that the spores have a dark yellow-ochre color. The umbo when present is small and almost papilla-like.

Tubaria tenuis.

Pileus membranous, hemispherical or convex, obtuse or subumblicate, glabrous, hygrophanous, reddish-cinnamon when moist, cream color or pale-ochraceous when dry, either faintly striate or sulcate-striate on the margin; lamellae 1–2 lines wide, distant, ventricose, adnate or slightly decurrent, tawny-ochraceous; stem slender, flexuous, often uneven, hollow, pruinose at the top, downy at the base, pale-yellow or cream color; spores elliptical,

.0003 in. long, .0002 broad; pileus 4–8 lines broad; stem 1–2 in. long, about 1 line thick.

Among mosses on gravelly hillsides. Pasadena, California. January. McClatchie.

This species is variable and somewhat ambiguous between *Naucoria*, *Galera* and *Tubaria*, but the attachment of the lamellae indicates a close relationship to the genus *Tubaria*. From *Naucoria melinoides*, which it much resembles, it may be separated by its paler stem and smaller spores and by the tendency of the pileus to become centrally depressed or umbilicate. From *Naucoria pygmaea* and *Galera pygmaco-affinis* it may be distinguished by its yellowish stem and adnate or decurrent lamellae.

CORTINARIUS INTRUSUS.

Pileus fleshy, rather thin, convex, then expanded, glabrous, somewhat viscid when moist, even or radiately wrinkled on the margin, yellowish or buff, sometimes with a reddish tint, flesh white; lamellae thin, close, rounded behind, at first whitish or creamy white, then cinnamon, often uneven on the edge; stem equal or slightly tapering either upward or downward, stuffed or hollow, sometimes beautifully striate at the top only or nearly to the base, minutely floccose when young, soon glabrous, white; spores broadly elliptical, brownish cinnamon, .00024 to .0003 in. long, .00016 to .0002 broad; pileus 1–2.5 in. broad; stem 1–3 in. long, 3–6 lines thick.

Mushroom beds, manured soil in conservatories or in plant pots. Boston, Massachusetts. R. Macadam. Haddonfield, New Jersey. C. McIlvaine.

This interesting species is closely allied to *Cortinarius multiformis* and belongs to the Section Phlegmacium. It has a slight odor of radishes and is pronounced edible by Mr. McIlvaine. Its habitat is peculiar, but it possibly finds its way into conservatories and mushroom beds through the introduction of manure or soil, or leaf mold from the woods. It seems strange, however, that it has not yet been detected growing in the woods or fields. *Hebeloma fastibile* is said sometimes to invade mushroom beds, and our plant resembles it in so many particulars that it is with some hesitation that I separate it. The chief differences are in the stem and spores. The former, in *Hebeloma fastibile*, is described as solid and fibrous-squamose and the latter as 10x6 micromillimeters in

size. The brighter color of the smaller spores and the stuffed or hollow smooth stem of our plant will separate it from this species.

HYPHOLOMA ATROFOLIUM.

Pileus submembranous, at first convex or hemispherical, then broadly convex, commonly umbonate, minutely and irregularly furrowed, striate to the apex when mature, hygrophanous, burnt-umber or wood-brown when moist, fading to pale-tawny or cream color in drying, veil fugacious; lamellae subdistant, adnate, at first pale-brown or drab, then dark seal-brown, almost black; stem slender, fibrillose, hollow, pallid or cream color; spores very dark-brown, elliptical, .0004 in. long, .0002 broad; pileus 9–24 lines broad; stem 1–2.5 in. long, 1–1.5 lines thick.

Among bushes. Pasadena. January. McClatchie.

The plants are gregarious or loosely caespitose. The lamellae, when mature, are almost black, and on this account the species might be sought in the genus *Psathyrella*, but the form of the pileus indicates a closer relationship to the genus *Hypholoma*. Its hygrophanous character places the species in the section Appendiculata. In some respects it approaches *H. hymenocephalum*, from which its convex pileus, less close and darker colored lamellae and longer spores will separate it.

PSATHYRELLA GRACILLIMA.

Pileus membranous, convex or nearly plane, finely striate nearly to the disk, subhyaline, bluish-white with a pinkish tint, the disk yellow and commonly depressed; lamellae thin, close, rounded behind and adnexed or nearly free, light slate color when young, becoming black or variegated with black; stem slender, elongated, erect, hollow, whitish or cream colored; spores oblong-elliptical, pointed at one end, .00055 to .0006 in long, .00024–.0003 broad; pileus 6 to 18 lines broad; stem 3–5 in. long, about 1 line thick.

Damp ground among weeds. Kansas. July. Bartholomew.

The notes of the collector describe the spores as dark brown, but they appear to me when viewed by reflected light to be black. The plant is very graceful and fragile. Its relationship seems to be with such species as *Psathyrella hiascens*, *P. trepida* and *P. hydrophora*, from all of which it may be separated by the attachment of the lamellae. The depressed disk suggests *Coprinus plicatilis*, but the specimens give no evidence of the deliquescence of the lamellae.

PSATHYRELLA DEBILIS.

Pileus membranous, campanulate, umbonate, finely striate nearly to the umbo, subhyaline, whitish, becoming grayish; lamellae thin, narrow, close, adnate, whitish when young, becoming black; stem slender, weak, flexuose, never erect, hollow, white; spores broadly elliptical, .0005 in. long, .0003 broad; pileus 6–15 lines broad; stem 2–3 in. long, 1–1.5 line thick.

Damp ground attached to decaying stems. Kansas. July. Bartholomew.

The plants are suggestive of *Psathyra gyroflexa*, but they differ in the umbonate pileus, the larger spores and in having no purplish tint to the lamellae.

BOLETINUS APPENDICULATUS.

Pileus fleshy, convex, glabrous, ochraceous-yellow, the margin appendiculate with an incurved membranous veil, flesh pale-yellow, unchangeable; tubes rather small, yellow, their mouths angular, unequal, becoming darker or brownish where wounded; stem solid, slightly thickened at the base, yellow; spores pale-yellow, oblong, .0004 to .0005 in. long, about .00016 broad; pileus 4 to 8 in. broad; stem 2 to 3 in long, 4 to 6 lines thick.

Under or near fir trees. Washington. September to December. Yeomans.

BOLETUS TABACINUS.

Pileus fleshy, convex or nearly plane, subglabrous, often rimose-areolate, tawny-brown, flesh at maturity soft and similarly colored; tubes concave or nearly plane, depressed around the stem, their mouths small, angular, colored like the pileus; stem subequal, solid, reticulated, concolorous; spores oblong or subfusiform, .0005 to .00055 in. long, about .0002 broad; pileus 2.5 to 5 in. broad; stem 1.5 to 3 in. long, 6 to 10 lines thick.

Along roadsides. Alabama. May. Underwood.

The species is referable to the section Calopodes, but the tubes are more or less depressed about the stem. It is well marked by its color which is some shade of brown or tawny-brown throughout, inclining at one time toward wood-brown, isabelline-brown or broccoli-brown, at another toward sepia-brown. The flesh in the dried specimens appears a little darker than the surface of the pileus. It is almost tomentose in texture.

POLYPORUS BARTHOLOMAEI.

Pileus thin, rather soft but tough, obovate or subspathulate,

azonate, unpolished, thin on the margin, narrowed behind into a flattened stem-like base, whitish; pores small, short, subrotund, decurrent, whitish; pileus 6–10 lines broad, about 1 line thick.

Decaying sticks and chips on damp ground. Kansas. July. Bartholomew.

This plant resembles *Polyporus humilis* in size, color and general appearance, but it differs from it in texture. The notes of the collector say that the pileus is hygrophanous. In the dried specimens its upper surface appears almost as if minutely tomentose or velvety pubescent. The margin beneath is sterile.

TYLOSTOMA PUNCTATUM.

Peridium subglobose, flattened and umbilicate at the base, the external peridium falling away above, persistent at the base, the internal peridium papery but rather firm and tough, minutely and irregularly punctate-pitted, whitish, the mouth slightly prominent, small, lacerated; stem cylindrical, obscurely squamose or rimose-squamose, sulcate-striate above, hollow, subferruginous, white within; spores pale-ferruginous, globose, minutely warted or roughened, .00016 to .0002 in. broad, the threads of the capillitium hyaline, sparsely branched, .0003 to .0004 in. broad, broader than the spores, the ends obtuse or subtruncate, occasionally thickened; spores globose, .00016 to .0002 in. broad; plant 1 to 1.5 in. high, peridium 5 to 6 lines in diameter; stem about 2 lines thick.

Sandy ground in pastures. Kansas. July. Bartholomew.

The peculiar character of the species is in the minute punctate pits or impressions in the inner peridium. These are somewhat scattered and unequal and are similar to those seen in the seed coat of some species of *Lithospermum*. I find no mention of such a character in any of the published species.

CLAVARIA PLATYCLADA.

Clubs caestipose, more or less connate at the base, simple or forked, rarely with one or two irregular branches, solid, compressed, tapering below into a whitish base, canary yellow, white within, the tips flattened, obtuse, becoming brownish with age; spores globose, .0002 to .00024 in. broad. Tufts 3 to 4 in. high; clubs 2 to 4 lines wide, scarcely more than 1 line thick.

Woods. Maine. September. Harriet C. Davis.

The species is closely allied to *Clavaria fusiformis*, from which it is separated by its solid, obtuse, compressed and often forked or branched clubs tapering below into a whitish base.

PEZIZA ODORATA.

Cups .5 to 3 in. broad, gregarious or scattered, thin, sessile, rather brittle when fresh, shallow expanded or even convex from the decurving of the margin, at first brownish, then white or whitish, the hymenium ochraceous-brown; asci cylindrical, opening by a lid, .01 to .012 in. long, .0006 to .0008 broad, paraphyses filiform, obscurely septate, slightly thickened at the tips; spores elliptical, even, .0008 to .0009 in. long, .0004 to .0005 broad.

Ground in a cellar. Maine. June. F. L. Harvey.

The plant when fresh has a peculiar fungoid odor suggestive of that of chestnut blossoms. The species is apparently allied to *P. Petersii*, from which it may be distinguished by its larger spores and distinct but peculiar odor. The spores also are not binucleate, as in that species. In drying, the hymenium is apt to become blackish.

SLEROTINIA INFUNDIBULIFORMIS.

Cups thin, regularly infundibuliform, glabrous, stipitate, rugose, bay-brown; hymenium even, bay-brown; stem long, slender, flexuous, attenuated downwards, colored like the cup, sometimes a little darker toward the base, growing from a small wrinkled black sclerotium; asci cylindrical, 8-spored, .005–.006 in. long, .0004–.0005 broad; spores elliptical, .0005 in. long, .00025 broad; paraphyses filiform, slightly thickened at the apex; cups 3–4 lines broad and high; stem about 6 lines long.

Wet woods. Newfoundland. August. Waghorne.

Further Observations on Antidromy.

BY GEORGE MACLOSKIE.

It was shown in the BULLETIN of last year (p. 389, 466), by examples drawn from a large number of orders of Phaenogams, that there are probably two castes, a dextrorse and a sinistrorse, of every species. This "antidromy" was also traced generally to a diversity of the embryo in the seed, depending on whether it grows on one or other margin of a carpellary leaf. A further explanation, then only suggested, proves to hold in many cases: namely, that a forking rootstock produces antidromic plants on the two branches of the fork. This last explanation applies to such cases as *Richardia*, *Podophyllum*, *Nuphar*, *Helonias*, *Chaemae-*

lirium and many other Liliaceae, and *Carex* (whose tussocks, arising from a common stock, consist of relatively antidromic plants). This fact may have a bearing on the problem of homology of seeds and root-buds, and may suggest a diversity between subterranean and ordinary cauline buds.

During the past summer I have enlarged my range of observations on this subject by help of the great botanical gardens and museums of Europe, and have found light on some difficult points.* Among the numerous additional evidences of antidromy I may cite many Cactaceae (as *Mammillaria*), *Tamarix Gallica*, Screw Pines (*Pandanus utilis*, etc.). and generally the palms. Dr. Urban, of the Berlin Botanische Museum, has published papers on the spirally twisted fruits of species of *Medicago*, and of certain genera of Loasaceae. His monograph of the genus *Medicago* shows that most of the species have a sinistrorse twist, a few (as *M. tuberculata*) mostly dextrorse; and he knows of no clear case of one individual plant having two kinds of twists among its fruits. These results on the whole harmonize with the general rule of antidromy; and they seem to be well established by his large collection of specimens which he kindly showed me. I also examined living specimens of this genus in the Botanische Garten, but failed to correlate the spirality of the fruits with the phyllotaxy of the plant which bare them: this failure was due to the difficulty of deciding the order of phyllotaxy of such straggling plants. His paper on *Loasaceae* brings out the interesting facts that in some of the species the fruits are spirally twisted, the direction of the twisting being either one for a species (several species of *Cajophora*), or constant in a genus (*Blumenbachia*) and dextrorse or locally specialized, all the plants from one locality being alike, but different for the same species between different localities (*Sclerothrix*); or the fruits following one another in one specimen may be antidromic (species of *Cajophora*).

* I beg to express my thanks for courtesies extended by the officers of Kew Gardens, England; of the Jardin des Plantes, Paris; by Mr. F. A. Bather, of the Natural History Museum, London; Herr Otto Müller, of the Botanische Garten of the University of Strassburg; and Dr. Ign. Urban, of the Museum der Koenigl. Botan. Garten of Berlin. I may explain that in quoting Dr. Urban I render his word "dextrorse" by "sinistrorse" and conversely, so as to turn his terminology into conformity with our method of designating the spiral thread of a common screw as "dextrorse."

Of these plants I examined the living *Blumenbachia hieronyma* Urb., and found that whilst all its fruits were dextrorsely twisted, as he had stated, its foliage shows true antidromy. Though the leaves are opposite, only one of a pair bears an axillary pedicel, and in some plants the leaves having a pedicel form a dextrorse, in others a sinistrorse spiral. Thus the plant is found to have antidromy in its foliage, and monodromy of its carpels. (In other cases, *e. g.*, *Impatiens*, and *Prosopis* carpels as well as foliage are antidromic and very frequently the anthotaxy, or order of growth of the components of an inflorescence, is antidromic.)

There are very many torsions in plants which have no relation to antidromy, and which are usually constant in all individuals of a species; as is Convolvulus, Hop, etc. *Canna* proves to be of this kind; its numerous species and many thousands of specimens growing in the Jardin des Plantes, all have the young leaves *directly* enfolded (that is clock-wise); *Musa* is similar, but the case is different with *Aloe*, as all its young leaves are folded in the same direction in one plant, but antidromically as between different plants.

The trunks of the Horse Chestnut, and of Catalpa, are always twisted dextrorsely; this is best seen in old trees, and is very obvious in the miles of old trees of Horse Chestnut, which extend from St. Cloud towards Versailles. Each trunk is fluted and strengthened by rounded pilasters representing the continuation downwards of the large branches, and always dextrorsely twisting. As the leaves are opposite, we cannot readily determine the order of phyllotaxy. But the seeds even when viewed from the outside are easily seen to be of two kinds, the radical of one turning towards your right, of the other towards your left. Even the small winged seeds of *Catalpa* have a mark which betrays the diversity; and also the opposite leaves of *Jacaranda obtusifolia* H. B.K., of the same Bignoniaceous order with *Catalpa*, has its opposite leaves arranged in spiral orthostiches, which leave no doubt as to the antidromy.

The leaf-scars and cone-spirals of Gymnosperms conclusively prove their title to a place in the realm of antidromy, not only the pines and araucarias, but the various genera of Cycads, as *Cycas*, *Zamia*, *Ceratozamia*, *Encepholartos*, are uniformly anti-

dromic (the peculiar habit of Gnetaceae obscures the evidence with them). Of still greater interest were the coal-plants and the modern tree-ferns. In the South Kensington Museum of Natural History I found *Lepidodendron Sternbergii* and *Sigillaria tesselata* clearly antidromic, the leaf scars forming different spirals, and sinistrorse and dextrorse specimens of each being seen. Of the fruits of *Palaeoxyris carbonaria* some were twisted in one way, some in the other way. The fact that some of the fossils have regularly bilateral markings received a curious illustration from the tree-ferns. We have in Princeton a piece of fern-stem (an *Alsophila*) with its scars absolutely symmetrical. But in Kew Gardens Museum and in one of the greenhouses in Paris I saw tree ferns (*Cyathea Schauschii* Mart. and *Alsophila Brunoniana* Wall.) having about 10 feet of the lower part antidromic, that is dextrorse and sinistrorse in different plants, and the upper part of the same stems closely beset with symmetrically placed scars. This shows how the primitive antidromy may become exhausted, and may disappear, or even as in *AEsculus*, may be overlaid by a different kind of spirality subsequently acquired.

I should add that Herr Otto Mueller of the University Gardens of Strassburg informed me that he has often observed the duplex order of phyllotaxy, though he had never seen any reference to this in print.

PRINCETON, September 29, 1896.

Botanical Notes.

Coleosporium Campanulae (Pers.) Winter. While visiting at Earlville, Madison county, N. Y., the present summer, I found the common *Campanula rapunculoides* everywhere covered with this fungus, which does not seem to have been reported from this country, although it is common in Europe on this and other members of the *Campanulaceae*. Subsequently Mr. F. L. Stevens has sent me some of the same fungus collected at Jamesville, Onondaga county, N. Y. It is likely to be found elsewhere as soon as attention is called to it. L. M. UNDERWOOD.

Notes from Binghampton, N. Y. During the present year the botany of this section has been enriched by the discovery of several plants new to the region, and by the addition of several interesting facts regarding more common ones.

On May 31, 1896, I found a considerable amount of the mouse-ear hawkweed (*H. Pilosella* L.) growing on a dry bank near New Milford, Susquehanna county, Pa. The plant is reported to be not uncommon in that locality.

A dry wooded hill within the city limits of Binghampton, yielded an abundance of *Silene antirrhina divaricata* Robinson, in July.

Linnaea borealis was found on July 4, 1896, at Killawog, Broome county, N. Y., altitude, 1050 feet. The plant is reported from several points in this latitude, but so far as I am aware, always from higher elevations.

On the 12th of July 1896, a large swamp filled with *Woodwardia Virginica* was noted ten miles north of Binghamton. This fern is very rare in this part of the Susquehanna Valley. The only other station known to me was found by Mr. James A. Graves at Susquehanna, Pa.

Orontium aquaticum, previously known to grow here, has been found in much larger quantities in a swamp. On the borders of certain small lakes in the territory south of us, this plant is very abundant, but in all situations where it grows the fact that it is an introduced species seems apparent.

The corn-speedwell (*Veronica arvensis*) has become quite a weed in cultivated grounds. It differs from the usual *V. arvensis* in producing deep blue blossoms.

The stipules of *Porteranthus trifoliatus* are supposed to be small and awl-shaped, but in this locality specimens are common with ovate-lanceolate incised stipules three-quarters of an inch in length.

Ranunculus repens, which occurs occasionally in wet places, has taken up its abode in several lawns about the city. In such situations the leaves are white-spotted and close to the earth and the stems are flat on the ground and root at every joint. The whole plant is so low that the lawn mower will not touch it, and in consequence is hard to eradicate. WILLARD N. CLUTE.

Cleome serrulata spreading eastward.—This western species has now obtained a foothold east of the Mississippi River. I have noticed scattering plants for several years past, growing on the sandy banks of the above river at Rock Island, Ill., and apparently perfectly at home. A botanical friend informs me that it has crossed the river and become well established at East St. Louis, Ill. This showy plant will make a charming addition to our wayside denizens. FRANK E. MCDONALD.

Asplenium ebenoides, the rarest of our ferns, has recently been collected by me at Blacksburg, Va. My field notes are published in the October number of the "Linnaean Fern Bulletin."

W. ALPHONSO MURRILL.

Proceedings of the Club.

TUESDAY EVENING, OCTOBER 13th, 1896.

Vice-President Lighthipe occupied the chair and there were 33 persons present.

The following were elected active members:

Mrs. George Such, South Amboy, N. J.

Mrs. Edward C. Bodman, 835 Madison Ave., N. Y. City.

Miss Olive M. Ewing, Long Branch City, N. J.

Prof. L. M. Underwood, Columbia University.

Dr. A. Emil Schmidt, 448 East 59th St.

Prof. Francis E. Lloyd, Forest Grove, Oregon.

Mr. J. A. Lindbo, Stanton, Nebraska.

Mr. Martin Bimbaum, 939 2d Ave., N. Y. City.

Dr. Britton reported for the Field Committee that the field meetings during July and August, which during previous years had been unsuccessful as regards attendance, have this year been entirely successful.

Miss Ingersoll reported for the Herbarium Committee that a number of specimens had long needed mounting and placing in the herbarium. After discussion, it was unanimously resolved that the sum of ten dollars should be appropriated to pay for this work.

Dr. Britton spoke of the numbers of the BULLETIN which were out of print and stated that this want interfered with filling orders

for sets of that journal. He had thought of offering the early volumes of the MEMOIRS to the more recently elected members, to complete their files, at a reduced rate, the proceeds to go toward the reprinting of missing BULLETIN numbers. The proposition was discussed by Judge Brown. It appeared that about $200 would be required for this purpose. It was unanimously resolved that the editor be authorized to exercise his judgment about carrying out the proposed plan.

The regular program of the evening was then taken up.

Judge Addison Brown, "Notes from Connecticut;" Miss Helen M. Ingersoll, "Notes from the Palisades;" Dr. J. K. Small, "Notes from the Southern Alleghenies;" Rev. L. H. Lighthipe, "Notes from Florida;" Dr. H. H. Rusby, "Notes from Venezuela." Dr. Rusby also exhibited specimens of fruits preserved fresh and unaltered by the use of formalin. Prof. Lucien M. Underwood remarked upon fern collecting in Florida and Alabama. Dr. Britton spoke of his summer's work, which had included but a small amount of field observation, but had consisted chiefly in the proof-reading of the *Illustrated Flora* and in perfecting the plans for the Botanical Garden. He exhibited some diagrams showing tentative plans for the large greenhouse. Mrs. Britton spoke of her observations and collections in Pennsylvania and in the Adirondacks.

Index to recent Literature relating to American Botany.

Arnold, F. Labrador. Pamph. pp. 18. Munich. Jl. 1896.
List of 127 species of lichens, collected by Mr. Waghorne in Labrador.

Coville, F. V. Crimson Clover Hair-balls. Circ. 8. U. S. Dept. Agric. Div. Bot. pp. 4. 1896.
Account of balls of the hairs of *Trifolium incarnatum* formed in the stomachs of horses.

Dallas, Mrs. G. M. Minnewaska's Flora. Pamph. pp. 13. Jl. 1896.
List of species observed.

Dana, Mrs. W. S. Plants and their children. 8vo. pp. 272. *f.* 277. American Book Co. 1896.

Davidson, A. Catalogue of the Plants of Los Angeles county, Cal. Part 1, Phaenogamia. Pamph. pp. 36. 1 Jl. 1896.
List of species, with notes on distribution.

Davy, J. B. *Epilobium spicatum* in the Bay Region. Erythea, **4**: 151. 1 O. 1896.

Davy, J. B. Note on *Rubus leucodermis*. Erythea, **4**: 151, 152. 1 O. 1896.

Eastwood, A. Report on a Collection of Plants from San Juan County, in southeastern Utah. Proc. Cal. Acad. Sci. (II.) **6**: 270–329. *pl. 44–46*. Au. 1896.

Enumeration of 162 species, with novelties in *Polygala, Psoralea, Mentzelia, Houstonia, Grindelia, Erigeron, Dicoria, Cnicus, Atriplex* and *Eriogonum*.

Eastwood, A. New Stations for new Plants. Erythea, **4**: 151. 1 O. 1896.

Galloway, B. T. The Pathology of Plants. Exp. Sta. Rec. **7**: 725–735. 1896.

Notes on lines of investigation.

Gürke. *Hibiscus Lindmani*. sp. nov. Notizb. [illegible]n. Bot. Gart. Berlin, **1**: 180. 1 Au. 1896.

A new species from Paraguay.

Hasse, H. E. Lichens of the vicinity of Los Angeles.—II. Erythea, **4**: 96–98. 1 Je. 1896.

Hasse, H. E. Lichens of the vicinity of Los Angeles.—IV. Erythea, **4**: 150, 151. 1 O. 1896.

Hitchcock, A. S. Grasses of Kansas. Trans. Kans. Acad. Sci. **1893–'94**: 135–146. 1896.

Annotated list.

Hooker, J. D. *Pilocarpus Jaborandi*. Curt. Bot. Mag. *pl. 7483*. Jl. 1896.

Hooker, J. D. *Solanum cernuum*. Curt. Bot. Mag. *pl. 7491*. Au. 1896.

MacMillan C. Some Considerations on the Alternation of Generations in Plants. Pamph. pp. 41. Lincoln, Nebr. 1896.

Read before the botanical seminar of the University of Nebraska.

Meyen, F. Einiges über die schönen Kaktus-Arten auf der Westküste von Süd-Amerika. Monatsschr. Kakteenkunde, **6**: 138–140. 20 S. 1896.

Morgan, A. P. The Myxomycetes of the Miami Valley.—IV. Journ. Cinc. Soc. Nat. Hist. **19**: 73–110. *pl. 13–15*. Au. 1896.

Descriptions and figures of the Physaraceae.

Patouillard et Hariot, P. Liste des champignons récoltés en Basse-Californie par M. Diguet. Journ. de Bot. **10**: 250–252. *pl. 2.* 1 Au. 1896.
Enumeration of 13 species. *Batarrea Digueti* new.

Rothrock, J. T. Red Pine, Norway Pine. Forest Leaves, **5**: 152. *pl. 2.* Au. 1896.
With two illustrations of *Pinus resinosa.*

Small, J. K. Studies in the Botany of the Southeastern United States.—VI. Bull. Torr. Bot. Club, **23**: 295–301. 20 Au. 1896.
New species in *Ribes* and *Ilysanthes* with revision of N. A. species of latter genus.

Smith, A. A. The Development of the Cystocarp of *Griffithsia Bornetiana.* Bot. Gaz. **22**: 35–47. *pl. 1, 2.* 31 Jl. 1896.

Swingle, W. T. Bordeaux Mixture. Bull. Dept. of Agric. Div. Veg. Phys. and Path. 9: pp. 38. 1896.
Gives toxic effects upon fungi and algae.

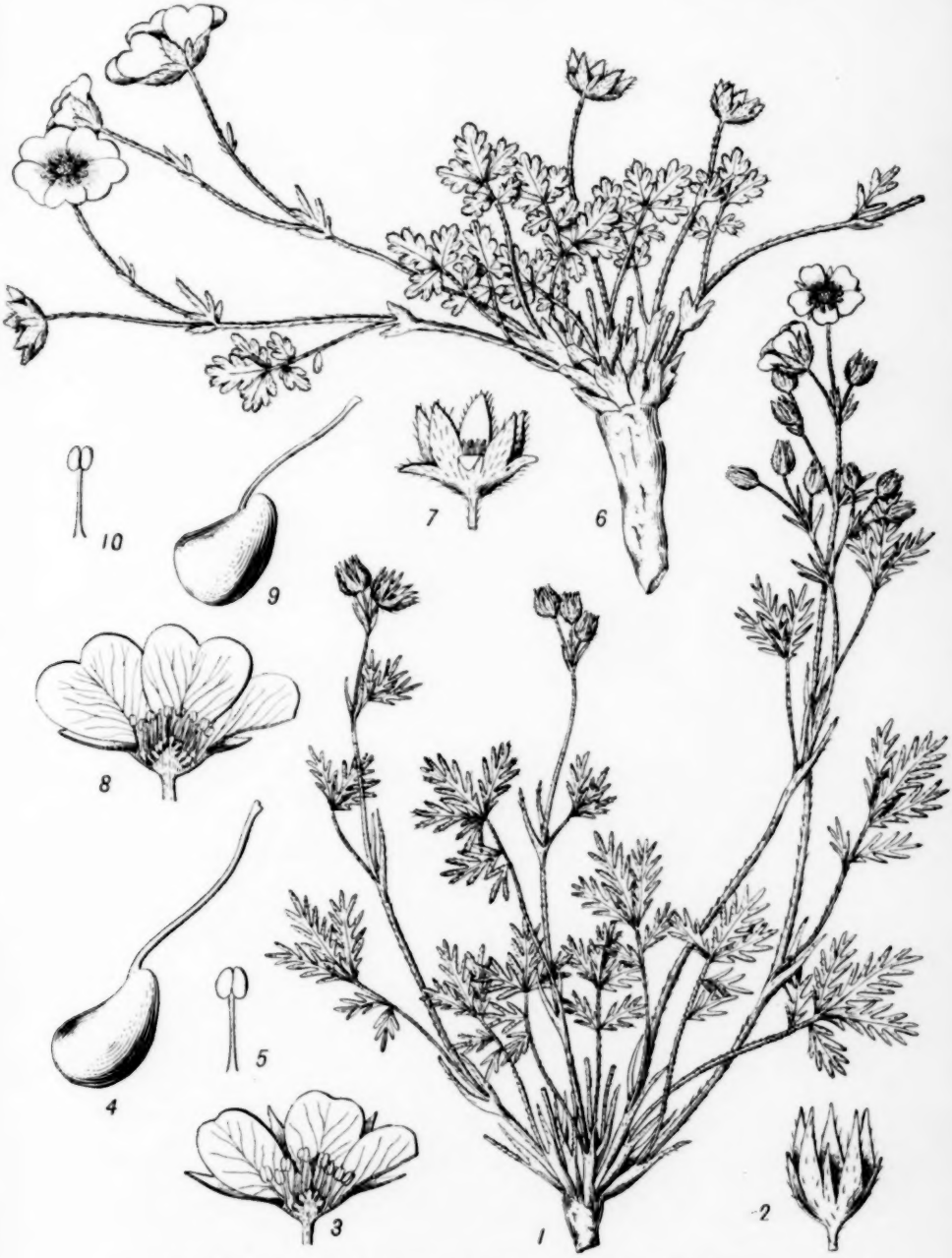
Walters, L. L. Erysipheae of Kansas. Trans. Kans. Acad. Sci. **1893'–94**: 200–204. *pl. 2.* 1896.
Descriptions and figures of the species.

Weber. Neue Kakteen aus Nieder-Kalifornien. Monatsschr. Kakteenkunde, **6**: 137, 138. 20 S. 1896.

Waugh, F. A. The Pollination of Plums. Bull. Vt. Exp. Sta. 53: 44–66. *f. 6.* Au. 1896.

Wheeler, C. F. *Sisymbrium altissimum* L. Bull. Torr. Bot. Club, **23**: 283. 20 Jl. 1896.
Notes extension of range into Michigan.

POTENTILLA SUBJUGA RYDB.



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